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THE AMERICAN GAS LIGHT JOURNAL

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CONTENTS

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 681

The End of the Meeting—President Nettleton's Address—Notes.

Why Good Gas? by Dr. A. W. Wilkinson 682

Twenty-fifth Annnual Meeting, American Gas Light Association—Abstract of Proceedings 683

First Day, Morning Session—Applications for and Elections to Membership—Report of Council—Reports of Secretary and Treasurer—Report of Committee on Education—President's Address—*A Method Successfully Employed to Obviate Naphthaline Troubles, by Mr. K. M. Mitchell—Discussion—Roll Call.

The Distribution of Gas, by Mr. D. Coats Niven 691

Action of the Bunsen Burner 692

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 692

An Editorial Change—Trustees, Troy (N. Y.) Company—Some Statistics from Kansas City, Mo.—Death of Mr. E. F. Michael—Welsbach Street Lighting, Eau Claire, Wis.—Cheap Fuel Gas, Richmond, Va.—The Hotel Meter was All Right—Canada Growls Against the Exportation of Natural Gas—Carthage, Mo., Negatives a Municipal Electric Lighting Plant—Something More about the Proposed Opposition Company, Trenton, N.J.—Contract for the Berlin Iron Bridge Company—Messrs. James R. Floyd's Sons—Damage Suit, Lexington, Mass.—Improvements on the Wilmington (N. C.) Plant—Annual Meeting, Toronto, Ont—Welsbach Street Lighting, Seattle, Wash.—The Method in California of Securing Gas Franchises—And Other Items.

A Seventy Thousand Horse Power Central Station 694

The Market for Gas Securities 694

BRIEFLY TOLD.

THE END OF THE MEETING.—The Old Point Comfort meeting of the American Gas Light Association, so far as its main points on the regular business days were concerned, was pretty well reported in our special dispatches of a week ago; but there was a third day, a day that was devoted to a specially arranged outing trip, the records of which could not be transmitted in time for publication in the issue for last week. Some of the members left for their homes on the evening of Thursday, which action proved that the pleasures of the banquet hall were not sufficient to hold them; and many others took their departure on Friday morning, preferring to risk the "dangers of the deep" in volume rather than to prefix their "real ocean trip" by a sail over the Roads and the James river. Despite the departures, a goodly and congenial number boarded the steamer "Hampton Roads" at 10 A.M. of Friday. The weather conditions were fairly good, and the trip to the first objective point—the commodious, complete and well-balanced plants of the Newport News Shipbuilding and Dry Dock Company—was made in good time. A somewhat hurried inspection of the Company's really complete equipment was quite sufficient to convince the observer that here is more than the hope that other than one first-class naval construction establishment exists in the United States. Of course, the beautifully proportioned war vessel, the "Kearsage," which is now well along towards completion on the Company's stocks, attracted the greatest attention; and while all compared the new "Kearsage" with its historic predecessor of years ago, only to admit the superiority of the former, so far as size, strength and beauty go, all further agreed that if the new one in its old age shall have only a record equal to the old record of the elder "Kearsage," another example of handsome is that handsome does will have been recorded on our naval annals. Not that we have the faintest wish that the new "Kearsage" may sail in times like those during which the old "Kearsage" sailed; only that if the new is to be in trouble may it emerge therefrom as did the old. A light luncheon enabled the voyagers to all the more complacently view the changing scenery of the progress of the trip along the James river to Norfolk and Portsmouth. At the Portsmouth Navy Yard there was some fair sign of activity, and Norfolk's smoking stacks disclosed the pleasing fact that this busy port in the ante bellum days was neither dead nor sleeping. In fact, the blur of the pall of incomplete combustion is positive proof that Norfolk lives in the world of commerce; and that her shipments are of goods other than garden truck and bivalves. The return trip was pleasantly and smoothly made. Shortly before 3 P.M. the Chamberlin was reached, in ample time for Manager Swett's prolonged and elongated luncheon, and quite before 8 o'clock the "vast majority" of the Association's members and guests were on their respective home journeyings, at the start filled with pleasant memories of their tarryings at Fort Monroe. Some hours later (and many hours thereafter), the filling was not so compact, in the instance of those who tempted the sea; but as all's well that ends well, the memories of the start have not been expunged—which memories may be summed in the words that those who took part in the Old Point anniversary of the Association's birth have nothing to regret.—C.

PRESIDENT NETTLETON'S ADDRESS.—The address of President Nettleton, at the Old Point meeting of the American Association, was listened to with attention, was received with favor, and can be digested with profit. Such summing up respecting its lines may not be successfully controverted, for those who were present at the meeting know full well the measure of attention and favor accorded it; and we unhesitatingly take a chance that our readers will admit their study of it cannot lead to mental indigestion. That which Mr. Nettleton speaks or writes requires no translating; his sentences explain each other, and the argument as a whole speaks for itself. Take, for instance, his presentation of the water fuel gas versus coal fuel gas systems. It may be said that in this statement he puts forth nothing startlingly new; but it may be further said that his exposition of the matter is quite bright in its clearness. Again, and rather oddly, too, his doubts respecting the efficacy of blue water gas, as an ordinary agent for the many scores of uses to which fuel gas must be applied, in fairly large residential centers, on ordinary domestic account, or in small and intermittent commercial uses, are corroborated by Dr. Wilkinson, whose contribution before the last meeting of the Society of Gas Lighting, on the subject of "Why Good Gas?" will be found in our current issue. President Nettleton objects to "blue water gas" for ordinary heating use, and Dr. Wilkinson just as strongly objects to "blue gas" of any kind for ordinary illuminating use. Both are right, for the service that is not in a thing cannot be exacted from it. There are many points of strength in President Nettleton's address that are evident enough from his exposition of their application, which fact renders comment at our hands not only unnecessary but unseeming, still we would like to say a word or two in support of his contention regarding street illumination by means of Welsbach lamps. Concluding his reference to this most important matter, President Nettleton remarked: "From the facts and figures given above, it looks as if it was not impossible that the time would come when this form of street lighting might be very generally adopted." In this we cordially agree; for the system in this country, from its straggling beginning here some three years ago, has been tested systematically, until now many good working examples are to be viewed in America, not the least imposing and successful of which is at hand in New York. Mr. Bradley, the competent and careful Engineer of the Consolidated Gas Company, should receive the credit for the New York trial, and although it was not thought much of at first, his liberality and the pertinacity of the people in charge of the practical end of the experiment have resulted in an exhibition that points clearly towards the ultimate complete success of the Welsbach lamp as a means of thoroughly illuminating ordinary outdoor spaces, even in large cities. Take it all in all, President Nettleton's address was a striking feature of the technical programme of the American Association's 25th meeting. Perhaps it would have been still more satisfying had he told us something about what could not be accomplished with electric lighting; but there will be time enough for that later on.

NOTES.—A petition was filed in one of the Philadelphia courts last Thursday asking for the appointment of a receiver to administer the estate of the Acetylene Light, Heat and Power Company, of that city. The Company was "founded" in 1895, with a capital of perhaps 1½ millions, subscriptions for which were eagerly made. In the complaint it is alleged that the moneys paid in by the subscribers (about $150,000) have been spent, "though at no time has it engaged in the business for which it was chartered."——It is decided that Mr. Henry D. Walbridge, now in charge of the managing end of the affairs of the Grand Rapids (Mich.) Gas Light Company, will take the place of Manager of the Detroit (Mich.) Gas Company. It is possible he will not assume charge until January 1st.——Our item columns for the week report a queer suit for damages against the Lexington (Mass.) Gas Company. When the item was written we did not know what the result of the trial had been. The result, as we were since informed, was a verdict for the Company.——The proprietors of the Citizens Gas and Electric Company, of Jacksonville, Fla., are to be congratulated over their last move in putting the price of gas at figures that must compel its use by many who heretofore felt unable to avail themselves of its advantages, compared with other lighting and fuel mediums. On November 1 the rate on illuminating supply account is to be $2 per 1,000 gross, the following discounts to apply, based on monthly quantities and prompt payment: Bills of $5 and under, 10 per cent. off; of $5 to $15, 15 per cent.; over $15, 20 per cent. For an exclusively fuel supply, monthly bills of $4 and over, 25 per cent.; less than $4, 10 per cent.——Mr. William H. Bradley, Chief Engineer of the Consolidated Gas Company, and Mr. L. B. Gawtry, the Company's Purchasing Agent, sailed for Europe last Saturday. Their trip is likely to lead to important results in local gas works construction.

[A paper read before the Society of Gas Lighting.]

Why Good Gas?

By DR. A. W. WILKINSON.

There never was a time when the demand for good gas was greater than at present, and there never was a time when the knowledge for making good gas was greater; yet in many places the gas is so poor that the earlier attempts at gas making were kings to them. This condition is brought about by the constant urging of the engineers to make cheap gas. They investigate all the known processes; coal, wood and water were in turn tried. Cheaper materials, or none at all, are used for purification. They save a penny or two and produce so poor a gas that there is constant complaint.

The first question asked of a gas engineer is, "How cheap can you make gas?" not "How good can you make it?" I remember asking this same question of an engineer. His answer was, "Dirt cheap; so cheap and dirty that I wonder anyone takes it. I know they would not if they could help themselves, and I am sure they are looking forward to the time when an opposition company will start, or that electricity will be substituted. I make such a gas as our directors wish me to. At the same time I feel it is very short sighted to do so. As long as the gas will burn and give some light it is good enough; the only thing they fear is an opposition company, forgetting they have most active competitors in kerosene and electricity."

The history of petroleum reads like a fairy tale. Most of us can remember when whale oil and the penny dips were our only sources of light. Some of the more wealthy used sperm oil and wax candles, but to the great public whale oil was the source of light. To get it, sturdy mariners scoured every sea from north to south, from east to west, and almost exterminated the great leviathan of the deep. Oil was expensive—$2 or $3 per gallon—and the reward was great. There were oil princes in those days as well as now. The supply did not equal the demand, and many substitutes were used; lard oil helped a little; a mixture of turpentine, alcohol and camphor (known as camphene) was largely sold, although dangerous; yet the demand was so great for light that people would take their chances in using it. Coal was distilled for lamp oil, known as coal oil. Hardly had this industry got started when petroleum was discovered, or, rather, brought to the notice of the public.

Almost all druggists had a sample of "Seneca oil," used as a medicine, but no one thought of making use of it for lamp oil; in fact, the quantity was too small to be of any use.

When Drake sank a well on Oil Creek, and got oil by the barrel, people began to feel that at last they had an unfailing source of oil that would be cheap and good. I remember hearing an old sea captain ridicule the idea of digging a hole in the ground and getting a substitute for whale oil. He said one might as well expect a beefsteak already cooked; but we have been doing it ever since, and getting oil, not a barrel but thousands of barrels daily. At first, all the products of distillation of petroleum were used in the lamp, and, as one would anticipate, explosions were frequent.

I remember a sample of oil brought to the college by a gentleman who wished to know what could be done to prevent these explosions. Some one suggested that the lighter oils be boiled off. It was done, and the residue burned perfectly. Thousands of dollars were spent in learning how to purify the kerosene, and in the making of a proper lamp. To day we witness the success. We see the cheapest of all known sources of light. It is sent to all parts of the world. From "Greenland's Icy Mountains to India's coral strands," we find American petroleum in palace and hut, used by the rich and poor alike, and so abundant that all can be supplied. We can scarcely imagine what would be the demand for gas if kerosene was taken away.

Again, we have another "Richmond" in the field, whose aggressive form seems capable of absorbing all the business of gas companies. I refer to electricity. When the source of electricity was the galvanic battery, gas companies had little to fear. The cost of zinc, as against the cost of coal, rendered the lighting by electricity out of the question; but when the dynamo was invented it was coal against coal, making it possible to produce light that would compete with gas.

The arc light in the days of the galvanic battery was almost as complete as to-day. Draper and others had experimented with platinum wire as an incandescent light, but not with any great degree of success. The substitution of the carbon wire by Edison gave so good a light that many saw a rival for gas. To-day it is a success; and a large per cent. of the lighting is in their hands. There are many points to recommend it. We enter a room, press a button, and the room is

lighted ; no matches required ; it gives little heat, which in summer is very important. There is no danger of setting fire to the curtains. No oxygen is taken from the room, no impure gases of combustion introduced. Drunken "bums," or would-be suicides, have no chance to kill themselves. Although the light is unsteady and expensive, yet for all that it has so many good features people will use it in preference to poor and impure gas.

At first it was thought that, not having any storage capacity depending upon the going of the engine or dynamo, there would be so many interruptions as to render the light unsatisfactory ; but all of these defects have been overcome, and we turn on the light with as much confidence as we do gas. I have used a half-dozen burners, for a year at the hotel in my room, and I do not recall a single time when the light failed to respond. At first the burners were short lived, now they seem to burn indefinitely. To compete with a light like this we must have a gas of great purity and high candle power.

The question is, "Can we make it?" We most assuredly can, if we wish. I will not go into all the details of gas making. I will take it for granted that the works are equipped with good furnaces, and with good retorts for coal gas making, and with good cupolas for water gas ; and will further call your attention to the matter of purification, a subject of great importance in making good gas. All coal contains more or less sulphur which, in gas making, is converted into sulphureted hydrogen—if the heats are high ; or into bi-sulphide of carbon, if the heats are low, or both. Sulphureted hydrogen is easily removed by iron or lime ; and, as a rule, the gas is quite free from it. Not so with bisulphide of carbon, which latter is a liquid. At common temperature it easily gives up its vapor, and it is quite difficult to condense it, especially when mixed with other gases. It is insoluble in water, has no affinity to combine with iron or lime, and it passes through the works. It appears at the consumers' burners, where it burns into sulphurous and sulphuric acid, very unhealthy to breathe, and destructive to goods, and the paintings of the room.

Many ways have been proposed for its removal, none of which are altogether successful.

If a certain amount of oil gas is made in one or more of the retorts, according to the size of the works, and the gas delivered into the hydraulic main with the coal gas, it will give the needed increased illumination. At the same time the oil that has failed to undergo decomposition (usually 10 to 20 per cent.) will dissolve and precipitate much of the bisulphide of carbon and will be taken out by the condensers.

Ammonia is another impurity that should be removed, for it burns into poisonous and destructive acids. Ammonia is so soluble in water that the scrubbers very effectually remove it, yet at times it will combine with carbonic acid, and escape solution in the scrubbers and appear in the lime boxes, requiring another scrubbing. If the lime is very wet it will absorb the ammonia as it is set free, and will not require a second scrubbing.

It is very poor gas making that permits air to appear in the gas. I have now to speak, to my mind, of the most important impurity in the gas ; that is, carbonic acid, and one that engineers at the present time are disposed to neglect to remove. Carbonic acid is a regular "dog in the manger." It will not burn itself or let other gases burn. It gives to the gas a reddish and smoky flame, and an ethereal odor in the room that many persons complain of, claiming that it gives them headache and other unpleasant feelings. One per cent. will kill 1 candle ; 10 per cent. will make coal gas burn blue.

Some engineers claim that they can make up the candle power with the use of more oil ; but the remedy is worse than the disease.

So far as quality of their product goes, engineers are constantly urged to make cheaper gas, and, having exhausted all the known ways of making gas cheap, as a last resort they try to economize by not purifying the gas. They sacrifice quality, and the penny saved is dollars lost in the sale of the gas. Lime is the only practical material for removing carbonic acid, and every engineer knows well how to use it ; and were it not for the constant cry for cheaper gas none would ever think of neglecting this important part of purification.

We do not have ammonia in water gas to any extent, but in every other way the gas is the same and requires as close attention to purification.

By the aid of petroleum or its product we can give the gas high illuminating power; by attention to purification we can make a gas that will for a long time to come compete with kerosene or electricity.

Taking all things into consideration, should we not make the very best gas we can, giving the highest practical candle power, and a gas that, when burned, gives the least possible impurities in the room ?

Would not the best gas pay the highest dividends ?

[Abstract of Proceedings.]

TWENTY-FIFTH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

Held in Hotel Chamberlin, Fort Monroe, Va., October 20, 21 and 22, 1897.

First Day—Morning Session—October 20.

The proceedings of the 25th annual meeting of the American Gas Light Association were commenced in the Hotel Chamberlin, Old Point Comfort, Fort Monroe, Va., at 10 A.M. of October 20, the President, Mr. Charles H. Nettleton, of Birmingham, Conn., in the Chair ; the Secretary (Mr. A. E. Forstall, of Montclair, N. J.) recording. The first business was the calling of the roll, after which the President congratulated the members on the outlook, as shown by the attendance, for a successful bringing off of the Association's silver anniversary. On motion the reading of the minutes of the last meeting was dispensed with. The Secretary then read the following report from the Council respecting

Applications for Membership.

Old Point Comfort, Va., Oct. 20, 1897.

To the American Gas Light Association :

Gentlemen—Your Council has approved the following applications for membership, and submit them to you with the recommendation that they receive favorable action :

Active.

Bissell, West, Jersey City, N. J., Assistant Superintendent United Gas Improvement Company, Jersey City, N. J.

Bowes, M., Raleigh, N.C., Superintendent Raleigh Gas Company.

Burrage, Albert C., 24 West street, Boston, Mass., President Boston, Roxbury, Dorchester, South Boston and Bay State (of Mass.) Gas Light Companies.

Cocke, J. T. Bowdoin, Athens, Ga., President Athens Gas Light Company.

Curtis, Samuel Philip, 26 Front street, Newark, N. J., Works' Manager at Front Street Station, the Newark Gas Company.

Glass, Sheldon J., Montgomery Building, Milwaukee, Wis., Secretary and Treasurer Milwaukee Gas Light Company.

Holden, Thos. F., 12th and M streets, S.E., Washington, D.C., Superintendent East Station Works, Washington Gas Light Company.

Kipp, Leonard P,, Sing Sing, N. Y., Secretary Sing Sing Gas Manufacturing Company.

Little, F. W., 223 East Market street, Akron, Ohio, Vice-President and General Manager the Akron Gas Company.

Marini, Virgil G., 356 Superior street, Cleveland, Ohio, Assistant Engineer Cleveland Gas Light and Coke Company.

Max, William J., 13 William street, Middletown, N.Y., Superintendent Middletown Gas and Electric Light Company.

Morrell, Edward E., Oak Park, Ills., Vice-President and Engineer Cicero Gas Company.

Reichelt, A. F., 350 Alexander avenue, New York City, Secretary and Treasurer Central Union Gas Company.

Slade, Clifford L., Port Chester, N. Y., Superintendent Westchester Gas and Electric Company, Port Chester, N. Y.

Spangenberg, B. H., St. Augustine, Fla., Superintendent St. Augustine Gas and Electric Light Company.

Strecker, Alexander H., Newark, N. J., Engineer and Superintendent the Newark Gas Company.

Summers, George F., Hackensack, N. J., Superintendent of Gas Department, Hackensack Gas and Electric Company.

Woods, George E., foot East 115th street, New York City, Chief Engineer Standard Gas Light Company.

Young, James M. H., Superintendent South Side Gas Company, Pittsburgh, Pa.

Associate.

Althouse, Wilson D., Room 719 Reading Terminal, Phila., Pa., coal merchant, Althouse & Kennedy.

Birchmore, W. H., 231 Adelphi street, Brooklyn, N. Y., gas chemist.

Carpenter, H. A., Allegheny, Pa., engineer with Riter & Conley.

Drummond, M. J., 192 Broadway, N. Y., manufacturer of cast iron pipe.

Graves, George W., 36 St. Paul street, Rochester, N. Y., Eastern Manager National Vapor Stove and Manufacturing Company.

Hartenfels, P., 120 Liberty street, New York City, gas specialties.

Jacobs, Charles H., Detroit, Mich., Vice-President and Managing Director, Buhl Stamping Company.

Pearson, Joshua Ash, 833 Drexel Building, Phila., Pa., Assistant Purchasing Agent, The United Gas Improvement Company.

Prendergast, Daniel J., 33 Nassau street, New York City, General Superintendent Welsbach Street Lighting Company of America.

Respectfully submitted, for the Council,

CHARLES H. NETTLETON, President,
ALFRED E. FORSTALL, Secretary.

ELECTION OF NEW MEMBERS.

On motion of Mr. A. C. Humphreys the Secretary was instructed to cast the ballot of the Association for the election to membership of the gentlemen named. Mr. Humphreys acted as teller. The newly-elected members who were present were formally introduced to the Association.

REPORT OF THE COUNCIL.

OLD POINT COMFORT, VA., Oct. 20, 1897.

To the American Gas Light Association :

Gentlemen—Your Council have the honor to make their annual report, as follows :

A separate report upon applications for membership recommends the election of 28 applicants. The resignations of 6 active and 2 associate members have been received and accepted.

The following list of papers has been approved, to be read at this meeting :

"Some Further Experiments on Interior Illuminination," by Alten S. Miller, Long Island City, N, Y.

"Chemical Notes on Purification," by Henry A. Mather, Brooklyn, N. Y.

"Gas Advertising," by R. M. Searle, Atlanta, Ga.

"A Report on Burner Stoppages," by Paul Doty, Long Branch, N. J.

"A Method Successfully Employed to Obviate Trouble from Naphthaline," by K. M. Mitchell, St. Joseph, Mo.

"Rust in House Pipes," by F. B. Wheeler, Long Branch, N. J.

"A Quadruplex Purifying Box: Why Not?" by F. H. Shelton, Chicago, Ills.

Your Council respectfully recommend for election to honorary membership in the Association, Messrs. George Livesey and Corbett Woodall. These gentlemen are so well known in the history of the gas industry that it does not seem necessary for us to make any plea before the Association in their favor. Their names should carry their own recommendation.

Your Council find that they cannot at present suggest any amendment to the Constitution in regard to the qualifications for membership, which matter was referred back to them at the last meeting of the Association.

The Council has taken a mail vote, with reference to the advisability of changing the date of the meeting from the date at present designated by the Constitution, to some date between the 10th and the 25th of September. This vote resulted as follows :

In favor of change	149
Against change	123
Neutral	13

In view of the small majority the Council simply report the fact without any recommendation as to this change; but, in accordance with the instruction of the Association at the last meeting, recommend for adoption the following amendment to the Constitution :

That Article VIII., Section 34, be so amended that it will read as follows :

34. The annual meeting of the Association shall be held on the third Wednesday of October of each year, at 10 o'clock A.M., at such place as shall be designated by the Association at the previous meeting. In case of emergency the Council shall have the power to change the time or place of meeting, or both, as so designated, by a three-fourths vote of all its members, at the call of the President, and such vote may be taken by mail.

The Council having been offered a medal, to be presented annually for the best paper to be read at the meetings of the Association, make the following recommendation :

Mr. W. R. Beal, having offered to present annually a gold medal to the writer of the most valuable paper presented at each meeting, the Council accept the same with thanks, and recommend that it be known as the "Beal Medal," and be awarded by a committee of three appointed by the President from among the Past Presidents.

Respectfully submitted, CHARLES H NETTLETON, President,
ALFRED E. FORSTALL, Secretary.

The recommendations of the Council were then taken up separately and adopted. The President, in announcing the results, declared it gave him great pleasure to report the election to honorary membership of Messrs. Livesey and Woodall. He asserted the gentlemen named were prominent members of the gas fraternity ; in fact, he thought Mr. Livesey had done at least as much for the gas industry as any other man who had contributed to the advancement of their common calling.

REPORTS OF SECRETARY AND TREASURER.

Secretary-Treasurer Forstall then submitted his annual reports for the year, ended September 30, 1897. The statements were accompanied by a certification from the Finance Committee (Messrs. G. G. Ramsdell, W. R. Beal and G. T. Thompson) that the same were correct as to form and detail.

The President then called for the

REPORT OF COMMITTEE ON EDUCATION,

which, in the unavoidable absence of the Chairman (Mr. Walton Clark), was read by Secretary Forstall, as follows :

To the American Gas Light Association : Gentlemen—Your Committee have to report as follows :

During the class year, beginning December 1, 1896, there have been issued to the students of the Class three lists of questions, and answers to the first two lists. The fourth list of questions and the Committee's answers to the third list of questions, are now in the hands of the printer and will be mailed within a few days. The students' answers to the fourth list of questions are due December 1. It is not expected, however, that they will be all in before January 1. Experience has indicated that not more than four lists of questions per year can be issued, with the expectation of receiving answers from the Class. While many of the Class send in their answers within a few weeks of the receipt of the questions, others—and in many cases those whom it is most desirable to retain in the Class—appear to be unable, from the conditions surrounding them, to prepare the answers under two or three months.

Copies of the questions and answers, and of the circulars issued to the Class, are attached hereto :

The Class at the beginning of the first year, in the autumn of '95, numbered 66 ; 23 dropped out during the year, leaving 43 remaining in the Class at the beginning of the second year, Dec. 1, 1896. The Class of the current year was composed, at the beginning, of the 43 above referred to, and 20 new members, making a total of 63. Of these 63, 14 have dropped out during the year, leaving 49 at present in the Class. The Committee have applications from 7 who desire membership, and who will be added to the Class the 1st of December. Therefore, if those at present in the Class continue their membership, the Class, at the beginning of the new year, Dec. 1, 1897, will number 56. (See exhibit attached).

The cost of the work this year is $179.30, for printing blue prints and stamps. (See account attached).

There is great interest in the work on the part of many members of the Class, and it is believed by the Committee that the results justify the Association in continuing to extend aid to these men. The average membership for the year has been over 50. The cost per member has been, to the Association, something over $3.50. The benefit to the members of the Class is certainly out of all proportion to the amount of money expended. The Committee also believe that the benefit to the American Gas Light Association has been very considerable.

The men who are working in the Class are doing it without hope of reward other than the knowledge they may acquire. The idea of giving prizes, or rewards of any kind, has been abandoned. Every man who works in the Class is working for the knowledge that he can obtain. He is not working in competition with others, and the only stimulus that he has is his desire to better qualify himself for positions of trust and responsibility in the gas business.

Respectfully submitted,

WALTON CLARK, Chairman,
ALEX. C. HUMPHREYS,
GEO. G. RAMSDELL,
C. J. R. HUMPHREYS,
ALFRED E. FORSTALL,
} Education Committee.

Number of members of Practical Class of the American Gas Light Association :

Beginning of first year, fall of 1895	66
Dropped out of class during year	23
Remaining in class beginning of second year, fall of 1896.	43
New members of class, beginning fall of 1896	20
In class beginning of second year	63
Dropped out of class during year	14
Remaining in class beginning of second year, fall of 1897.	49
New members of class, beginning fall of 1897 (to Oct. 15)..	7
In class beginning of year	56

The statement of expenditures ($179.30) of the Committee in connection with their work for the year was also submitted.

The President, in asking the pleasure of the Association in connection with the report of the Committee, spoke in very commendatory terms of their work, of the good they had already accomplished and of the excellent results to the profession as a whole bound to follow their future efforts. On motion of Mr. Greenough, the Committee received a hearty vote of thanks and a direction for their continuance.

Vice-President Humphreys here assumed the Chair, and President Nettleton read the following

ANNUAL ADDRESS.

Once again the season that brings us together has arrived, and, as we exchange greetings, it does not seem possible that 12 months have passed since we met in St. Louis. The years roll around rapidly, too rapidly for many of us, and the speed seems all the faster because we are so busy that most have neither time nor inclination to count the days or the months. And yet, in spite of the rush and bustle of our daily lives, which give few of us time to do our work as carefully or as well as we would like, in spite of this we individually and collectively make progress. The business as a whole advances and we advance with it. It may not be definite and distinct year by year, but compare this year with five or ten years ago, and it can surely be said that more gas is made and sold than then, that it is as good a gas or better, that it is produced cheaper and sold cheaper, and that the whole practice, or science if you will, of gas manufacture, is better understood and better worked out than ever before. Twenty-five years have elapsed since the meeting preliminary to the organization of this Association was held, and at this, our twenty-fifth annual meeting—our silver anniversary—it may not be amiss to note a few of the changes in that time. There are probably quite a number present who were selling gas in 1873 for $4.50 or $5 per 1,000 feet, and who will remember how unpleasant it was to collect the bills at that price; and the same gas, or rather a much better gas, is now generally sold from $2 down to $1, and in a few cases at even less than that price. To be sure our coal then cost $8 or more, and now less than half that sum, but our labor is paid fully as much, and, on the average, I believe, more. A yield of 6,000 feet per retort is now replaced by 9,000 and 10,000, and in some cases by 11,000 and 12,000 feet, and the yield of gas per man has increased from 15,000 to 25,000 feet, and, with labor saving machinery, to 50,000 feet. Water gas, with its brilliant white light, was not in use, except in the famous "deserted village" in the city of Brooklyn. The electric light was not, either as a competitor to worry us, or as an ally to help us by educating the people to the use of more light. Yes, times have changed indeed, and, we hope and believe, for the better. In this address I shall not attempt any general review of the field of gas engineering, but confine what I have to say to a few comments on some of the events of the year, and on a few matters that are now attracting more than ordinary attention.

One of the most encouraging matters connected with our Association, as indicating its strength and vitality, is the work of the Committee on Education. That they have done for the past two years, and are doing, a most excellent work, no one will gainsay. I doubt if any gas engineer or manager of a gas works in this country can read over the questions sent out to the Class, and the replies finally made up by the Committee, without getting some information, and if that be true, what must it be to the students, most of whom are young men with comparatively few years of experience. I am informed that the class averages about 50; that most work faithfully and conscientiously on the questions sent out, and that the interest in the work increases rather than diminishes. If this work be kept up, as we all hope it will, through a series of years, it can but result in giving the gas companies of this country a much more intelligent body of men as engineers and managers than they otherwise would have. As most of our membership know but comparatively little of the work of this Committee, I hope I will be pardoned, and I trust I will not be misunderstood, if I say a few words of a personal nature. The Committee is made up of some of the busiest men among our members, and when we consider the work involved in preparing the questions, the examination and marking of the replies, and the preparation of the answers of the Committee—in some cases involving several hours' work on one answer alone—it will be understood what an enormous amount of time some among the members of this Committee are giving; and for what purpose? I am sure the one feeling that animates their work, that dominates everything else, is to help those who want help; to raise the standard of intelligence among gas men, and to give the man, who for reasons beyond his control never had an opportunity to receive a technical education, a chance to do better work—a chance to rise. I am sure I but voice the sentiments of the entire membership of this Association when I say that we are, both as an Association and individually, under great obligations to this Committee, and especially to its Chairman, Mr. Walton Clark.

Since we met a year ago a gas exposition has been held in the city of New York, which certainly exceeded the expectation, and I think even the hopes, of the gas people of the country. It was not only a collection of much that goes to make up gas works and everything through which and by which gas can be consumed, but it was also a magnificent display of the possibilities of gas for lighting. Too much credit cannot be given to the gentleman, Mr. E. C. Brown, who conceived and engineered this scheme to a successful issue. The gas companies of the whole country are certainly under obligations to him.

During the past year fuel gas has attracted some attention, particularly in the State in which the speaker resides. An attempt was made at the last session of the Legislature to obtain the right to run gas pipes throughout the more populous parts of the State, in one case a distance of 56 miles, supplying not only isolated houses and factories, but villages and cities that might lie in the track of these pipe lines. Through these pipes it was proposed to distribute illuminating and fuel gas, how I never understood, except that the gas was illuminating gas pure and simple. These applications were opposed, of course, and as the fight before the Legislative Committee progressed the pipe line matters were dropped out of sight, and the main issues were confined to two points: First, to obtain the right for a fuel gas company, already established and doing business in the city of Bridgeport, to distribute illuminating gas, thus tacitly admitting that it was quite desirable, if not necessary, to sell illuminating gas in connection with a fuel gas business.

The second was in the city of Hartford, where an attempt was made to introduce an opposition company, laying two pipes in one ditch, one to carry fuel gas and the other illuminating gas. The testimony was largely on the value of fuel gas, which in this case was a non-luminous water gas of 300 heat units. A vigorous fight was conducted; but happily, as it seemed to those of us who were in the "opposition," the applications were defeated.

Probably the promoters in this matter are as well posted as any body of men in that branch of the gas business, and yet the following statement, gotten up by one of the experts employed, Mr. Eugene Vanderpool, would seem to convince, "beyond the shadow of a doubt," the most pronounced water-gas fuel-gas enthusiast that he must be mistaken, and that the road to success in fuel gas matters does not lie along the line proposed:

A gross ton of coal contains, in round figures	31,000,000 heat units.
When put through the plant in question it produces 50,000 feet of gas of 300 heat units per foot	15,000,000 heat units.
Loss in going through the plant, over	50 per cent.

Figuring in the same way, a ton of coal put through a coal gas works will contain 31,000,000 heat units, and will produce:

11,000 feet of gas of 650 heat units per foot, or	7,150,000 heat units.
1,200 pounds of salable coke (under the best conditions of regenerative furnaces) at 14,000 heat units per pound	16,800,000 heat units.
130 pounds of tar and 180 pounds of ammoniacal liquor, and their cash value, is greater than that of the weight of coal they represent. Inasmuch as this gives a gain economically, it is fair to charge up their actual weight at least in heat units—310 pounds at 14,000	4,340,000 heat units.
Total heat units available for use	28,290,000 heat units.

A loss of 2,710,000 heat units; or 8.74 per cent.

Could a more convincing theoretical argument be brought forward, that if one is determined to distribute fuel gas, as between the two, illuminating coal gas can probably be made with less waste of energy than blue water gas. Starting with a loss of one-half of the energy of the coal, add to it the labor in production, wear and tear, cost of distribution and interest, and it would seem as if a gas could not be sold at a price, as compared with the cost of coal, that anyone could afford to pay, except for very small quantities and for intermittent use.

For corroborative testimony from a practical standpoint. I cannot do better than to refer to the remarkable paper on this subject, by Mr. F. H. Shelton, read before the Western Gas Association in May, 1897.

This is, of course, a onesided statement in regard to the matter, and perhaps I have not done justice to the claims in favor of blue water gas; but, after hearing all that was said for and against fuel gas in the legislative hearings above referred to, I am more than ever convinced that

the only fuel gas that will ever be distributed and sold in a general way, and at a profit, is that which is made by an illuminating gas company, and the product must be illuminating gas.

The use of the incandescent gas lamp grows apace, both here and everywhere else throughout the world; and what a blessing it has been to the gas consumers and to the gas companies—and, I might add, what a gold mine to its owners. It has reduced the cost of using gas by one-half, and it has more than doubled the light. Its use in stores particularly has changed appearances so much that a Rip Van Winkle would hardly recognize our business streets in an evening, although no other changes had been made. During the past year competition has come in with our friends of the Welsbach Company, and to-day a good many burners are being put on the market. So far as the gas companies are concerned the trouble is that some of these competing burners are not as good as could be wished. The mantle does not last, and gives comparatively a poor light, and in consequence the consumer has, in his own estimation, "poor gas." So far as we can influence such matters, it ought to be in favor of the best burner, regardless (within limits, of course), of the cost of either burner or mantle. There are rumors of startling improvements on the other side of the ocean that we are likely to hear about more definitely during the next twelve months; improvements both as to the life of the mantle and as to quantity of light obtained per foot of gas consumed.

In the matter of street lighting with incandescent gas burners some progress has been made in this country. I have been informed that the Welsbach Street Lighting Company, of America, have now in operation 2,700 lamps in 18 cities, and are rapidly increasing the number. In a recent issue of one of our gas journals the following statement was made: "The German Gas Association sent out inquiries in regard to the use of Welsbachs on the streets, and received replies that they were being used, to a greater or less extent, in 245 towns (presumably most of these towns are on the Continent), and in that number of places there were 61,569 Welsbach lamps in use out of a total of 287,721 public lamps." To those who have not seen a street lighted with Welsbachs I can only say that the effect can be made very fine. I have in mind a broad street with lamps along each curb, each containing two burners, and located, as my memory serves me, not over 100 feet apart. The result was an even, pleasant light, that was equal, if not superior, to the extravagant use of electricity on Fifth avenue in New York city. From the facts and figures given above it looks as if it was not impossible that the time would come when this form of street lighting might be very generally adopted.

At the last meeting of the American Association one of our members read a very complete paper on the use of inclined retorts and the benefits resulting from the same. So far as I know no construction of this sort has been erected in this country, but their use is extending rapidly in England and on the Continent. I have before me a list of 17 gas works in England now using inclined retorts, and of 16 gas works on the Continent, either using or having in course of construction 3,052 retorts on this system. In this connection I desire to call your attention to a short extract from the able address of Mr. Corbett Woodall, before the Incorporated Institution of Gas Engineers, at their May, '97, meeting. By reason of Mr. Woodall's large connection with gas companies in England and on the Continent, he is probably one of the best authorities on the subject. He says: "The introduction of the system of inclined retorts is an innovation heartily welcomed, and which is having, and will certainly continue to have, a wide acceptance. It is not necessary I should remind practical gas makers that, while there are many and great conveniences attaching to this system, its possibilities of economy are limited. By its adoption, the proportionate number of workmen employed is greatly reduced as compared with hand labor, and is less even than what is required with an efficient system of mechanical stoking. It is possible also to carbonize a larger quantity of coal on the same ground area than with the system still generally prevailing. Further, as has been shown in several cases in England, and also in an admirable model which was shown at the last meeting of this Institution, it is possible to reduce the cost of houses inclosing inclined retorts considerably below their present cost for a given output."

With the most of our works in this country inclined retorts can never be used, owing to the comparatively small quantity of gas made, but in the larger works this reason does not apply, and with the low prices at which our excellent gas coals are sold it would seem as if it could not be long before the experiment would be tried here.

One of the facts of general business which has attracted more or less attention for years is that of a division of profits between the employers and the employed. It has been tried a great many times in various lines of work, and in several countries, with more or less success. In a report made to the British Parliament on this subject there is given the history of a very large number of instances of profit sharing in Great Britain. Many of them have been abandoned after a few years' trial, working unsatisfactorily for various causes. It seems to be in the main satisfactory when there are profits to divide, but when there are none, naturally the satisfaction is not so great. In this country, so far as I know, it has been attempted by only one gas company, and the President of that in a recent letter makes the following statement: That he is now paying the same dividend in cash to his men on the amount of wages received by each employee as the stockholders receive on their stock; that when starting this plan it was made conditional that the dividends should be invested in stock until each person owned not less than three shares; that, so far as inducing the men to become stockholders, the plan had not succeeded; but that so far as it had made the men more happy and contented, had avoided strikes and had reduced the price of the manufactured product, he was entirely satisfied, and that he would not change it.

During the past summer the speaker met the one among gas men who perhaps is the most prominent advocate of profit sharing, Mr. George Livesey, of the South Metropolitan Company; and, in brief, his experience is this: Starting in 1890, he has now introduced profit sharing among all the employees of the Company, numbering about 3,000. This is based on a sliding scale, the amount of bonus or profit divided being determined by the price of gas, which, in turn, is supposed to be more or less under the control of the men, as they work well and faithfully, or the reverse. With an initial price of 2s. 8d. for gas, for each penny that gas is sold below that price the men receive 1½ per cent. on their wages, up to 9 per cent.; after that figure is reached it is 1 per cent. for each penny reduction. As gas is sold for 2s. 3d., the dividend to the men is 7½ per cent. Of this bonus one-half must be invested in the stock of the Company. There is an alternative proposition by which a man may receive 1 per cent. instead of 1½ per cent., and draw the whole amount in cash. In consequence, the employees of the Company own to-day over $200,000 of its stock; and in a letter to the London *Times*, relating to this matter, Mr. Livesey asks and answers this question: "What about the Company? Have they received their money's worth? Unquestionably; yes, is the reply. During the whole period there has not been a single difficulty or any disagreement of the workmen. The work has been done better and in a more cheerful spirit, and it can be safely said the Company is better off financially for the $400,000 paid."

Recently in the New York *Tribune* a short editorial appeared, of which the following are extracts: "The policy of the Illinois Central Railroad Company, in encouraging its employees to buy stock of the Company, paying for the same in instalments, seems to have proved successful in more ways than one. Since the employees were invited to become stockholders, about four years ago, they have purchased and paid for nearly 2,000 shares, and partial payments amounting to nearly $60,000 have been made on 1,624 additional shares. But more important than any pecuniary returns to the employees of the Company is the fact that their ownership of the Company's stock will do more than anything to allay possible irritation between them and the Company. Both employer and employed will discover that their interests are identical, and that they will be equally benefited by any policy that helps to strengthen and enrich the road."

The ownership of stock is not in the line of profit-sharing, but it aims at the same ultimate object—to give the employees a direct moneyed interest in the success or failure of the corporation for which they work. It seems to the speaker that an ideal condition for any industrial corporation would be to have each employee a stockholder, and also receiving a sufficient amount from a division of the profits, so that in whatever move he made he should not be influenced by his work and his pay alone, but that he would be obliged as a matter of self protection to consider the interest and welfare of the corporation. Such a condition brings both sides to the same point of view; and, with the same point of view for both employer and employed, labor troubles ought to be, and probably would be, at an end.

The prepayment meter has not attracted as much attention in this country as in England, and while meters have been introduced in quite large numbers in a few cities here, the majority of the companies have used them very little. I have it on good authority that the total number of prepayment meters in this country in use at the present time is about 40,000, and these have been placed practically in the last two years. In the judgment of the speaker they have not received the attention that they deserve. In the accounts of the proceedings of the Associations in England and in the report of the annual meetings of

the various companies in that country, prepayment meters have received for several years a great deal of attention, and have almost always had favorable comment. As you know, The Gas Light and Coke Company of London have placed 65,000 of these, and the South Metropolitan 61,000. Mr. Livesey told the speaker this year that the great thing in gas matters in England to-day, in spite of the fact that it was commenced seven years ago, was the acquiring of new consumers among the poorer classes by means of prepayment meters, piping houses, and furnishing gas stoves, free. Of course it is but fair to say that these Companies invest nearly or quite $30 for each prepayment meter consumer, but on the other hand they charge 20 cents per 1,000 feet above the regular price for all gas sold in this way, and each consumer of this class with a range averages 20,000 feet per annum. In an experience running over a year with these meters, the speaker can say nothing except in their favor, and earnestly recommends them to the careful attention of all companies who desire to increase their business. In his experience almost ever meter has gained a consumer that with the ordinary meter could not have been obtained, and the ease with which the business is done—each month's transaction being finished when the meter has been inspected and the money counted—makes it still more desirable.

There have been several times in the past few years when I would have been very glad to have known the average amount of gas sold per capita throughout the country, but I did not know where to obtain accurate information on the subject. Thinking that perhaps others might be in the position to need this information as well as myself, I determined to incorporate it if possible in this address; and to that end I have sent out within the past few weeks over 700 letters to gas companies in this country and Canada, stating my object and requesting a reply to the series of questions enclosed. Of that number about 400 have sent replies, and of these I have been able to tabulate 384. I desire to express my thanks to the gentlemen who have kindly answered the questions, and I can only hope that my labor in this matter will be of interest and value to others, as well as myself.

In arranging the replies I have divided them into three classes: places under 20,000 population in the first; 20,000 to 100,000 in the second; and 100,000 and over in the third. The averages of 230 places are given in the first; 130 in the second; and 24 in the third, and are as follows:

TABLE NO. 1.—*United States and Canada.*

	Under 20,000 Population.	20,000 to 100,000 Population.	Over 100,000 Population.
1. Number of places.....	230	130	24
2. Population.....	2,364,489	5,418,476	7,459,650
3. Average population...	10,280	41,680	310,819
4. Gas sold.....	2,314,168,814	7,990,568,875	16,677,871,278
5. Number of consumers.	102,101	323,353	621,276
6. Average number of consumers.....	444	2,487	25,886
7. Average price.....	1.47	1.42	1.10 4/10
8. Total sold by meters..	2,238,303,371	7,685,203,229	15,475,959,050
9. Average sold per meter	20,523	23,586	29,478
10. Average amount received per meter.....	32.77	32.29	32.13
11. Sales per capita, feet; average by number of places.....	998	1,350	2,168
12. Sales per capita, dollars	1.58	1.80	2.42
13. Sales per capita by total quantity sold, and total population..... ..	978	1,474	2,237
14. Percentage of meters to populations.....	4 3/10 per cent.	6 per cent.	8 3/10 per cent.

Since the completion of the above table two errors have been found which do not, however, materially affect the averages. The corrections will be made before the same is printed in the "Proceedings."

All the averages, except those contained in line No. 13, are made up upon the basis of the number of towns in each class. I desire to call your attention to a peculiar circumstance that the average amount received per meter (line No. 10) is between $32 and $33 in all three classes. This may be purely accidental, but I am inclined to think that this amount represents the average amount that can be collected per meter. The sales per capita (line No. 11) increase very rapidly with the population; and if another class had been made of cities of over 500,000, I am confident that the sales per capita would have been very much larger than in the other three; but there were so few replies received from cities of this size that it would probably have been misleading to have done so with the information in my possession. In the preparation of this matter I have naturally given it considerable thought, and it has seemed to me that the sales per capita did not express the information we were really seeking. While the gas sold per capita is interesting, and for the purposes of comparison instructive, yet that quantity is, of course, affected to a greater or less extent by the price charged; and the real thing, the keynote of this particular subject, is the amount of money received per capita—the gas sold multiplied by the price charged—and you will notice that I have given averages on this point (line No. 12), and they also increase with the population, although the price is lower in the larger places. I desire also to call your attention (line No. 14) to the relation between the number of meters and the population, expressed in percentage, which also shows the higher figures for the larger places. Combining all of the 384 places together, we have a population of 15,252,615 with an amount of gas sold of 26,982,608,967 feet, and an average sale of 1,770 feet per capita.

Through the kindness of Mr. Norton H. Humphrys, of Salisbury, England, combined with information obtained from "Field's Analysis" for 1896, I have been able to place before you some results obtained in England. These I have grouped in three classes, by population, as in Table No. 1, and they are as follows. (See page 688.)

You will notice that the averages are nearly all larger except the prices charged, and those are much lower. With many others I have always hoped that we could some day sell here the same quantity of gas that is sold in England; but I am free to confess that the more I investigate the subject the more remote becomes the possibility of such a result. In winter the lighting hours at night are longer, and the cloudy days more numerous than in this country; and in the summer, while the lighting hours are shorter, owing to the higher latitude, and the cloudy days approximately the same, yet the greater heat of this country tends to lessen the amount of gas consumed for light; and yet it is warm enough in England, combined with other causes, to induce an enormous number to use gas stoves. To these reasons add the low price at which gas is sold—which I doubt if we can ever reach—and it seems as if sufficient cause had been shown why more gas is and will be sold in that country than in this.

In this connection I desire to call your attention to the sales of gas in London, on fifth column of Table No. 2. The figures given, except as to population, are taken from "Field's Analysis" above referred to. The population, as given in "Whittaker's Almanac," is something over 4,400,000, but I am told the London Companies reach out so far beyond the city limits that that number would be incorrect. I have, therefore, assumed an arbitrary figure of 5,000,000, which, of course, is only approximately correct. I desire only to call your attention to the enormous amount of gas sold, the large consumption per meter, and the very large sales per capita. Combining columns 1, 2 and 4 of Table No. 2, the totals are as follows:

Number of places.....	111
Total population.....	8,505,600
Total sales.....	36,107,393,000
Sales per capita.....	4,245 feet.

In the German *Gas Journal* of July 17th, 1897, there appeared an article, by Mr. Emil Merz, of Cassel, Germany. In it are elaborate tables showing the consumption of gas in a number of cities in the years 1895-96. From these tables it appears that the average sale per capita in 77 German cities is 1,830 feet.

To recapitulate: The average of gas sold per capita, from the above tables, appears to be, in—

The United States.....	1,770 feet.
Germany.....	1,830 "
England.....	4,245 "

Four deaths have occurred during the past year: Mr. Joseph R. Thomas, the Editor of the AMERICAN GAS LIGHT JOURNAL, who has met with us so often, and who was so well-known and so much liked by nearly all the membership of the Association; Colonel John W. Newell, the Secretary and Engineer of the Gas Light Company of New Brunswick, N. J.; Mr. Frederick W. Norton, Superintendent of the Nashua Light, Heat and Power Company, Nashua, N. H., and Mr. Joseph D. Weeks, the Editor of the *American Manufacturer and Iron World*, of Pittsburg. Mr. Norton's death occurred only October 2d, 1897, and the week before he was in Boston making arrangements to come to this meeting.

While we shall miss these gentlemen from our ranks, yet I think we can congratulate ourselves that the number is so small, and that as these vacancies occur the places are being filled, and well filled, and the work of the Association will go on.

The holding of this meeting at Fortress Monroe, in what has been de-

TABLE No. 2.—*England.*

15. Number of places	74	16	8 (included in 16)	21	London.
16. Population	1,048,600	650,000	434,000	6,807,000	5,000,000 (Assumed.)
17. Average population	14,170	40,625	54,250	324,142	.....
18. Gas sold	3,293,836,000	2,873,120,000	2,051,748,000	29,940,437,000	30,462,170,000
19. Average sales	44,511,295	179,570,000	256,468,500	1,425,735,095	.....
20. Number of consumers	.....	.....	41,577	761,441	448,047
21. Average number of consumers	.....	.....	5,197	36,259	.....
22. Average price	.....	.....	.70½	.59½	.626
23. Total sold by meters	.....	.....	1,875,770,000	27,749,686,000	28,828,973,000
24. Average sold per meter	.....	.....	47,469	43,625	64,344
25. Average amount received per meter	.....	.....	34.03	26.42	40.28
26. Sales per capita, feet; av'ge by number of places	3,178	4,614	5,457	4,797	6,092
27. Sales per capita, dollars	.....	.....	3.49	2.83	3.81
28. Percentage of meters to population	.....	.....	$9\frac{58}{100}$ per cent.	$11\frac{19}{100}$ per cent.	$8\frac{96}{100}$ per cent.

scribed by some, as an "out-of-the-way" place, is an attempt on the part of those who voted for it to meet away from the large cities, and incidentally to avoid placing the Association in a position where the local gas companies and supply people would feel compelled to extend hospitalities and courtesies. The matter is an experiment. For one I do not feel sure that our meetings, if held outside of the large cities, can be made as successful as they ought, but there is so large and so respectable a minority, if not a majority, who would like to see the experiment tried, that I would suggest that for a year or two the meetings be held away from the large places. If it be found that the attendance and interest lessen, surely those who favor the idea which controlled the location of this meeting will acquiesce in changing back to the old plan. In this matter, of course, the majority must rule, and all that any of us seek is the greatest good for the Association.

And now, gentlemen, I have nearly finished; the meeting is in your hands to make of it a success or failure. I believe there can be no question which will be the result. Thanks to the earnest efforts of a number of gentlemen, and to the pleadings of your Secretary, a list of papers has been prepared for this meeting that will, I think, compare favorably with those presented at any previous meeting of our Association. I would urge that each member make it his duty, and I trust it will be his pleasure as well, to attend promptly the sessions of this meeting, and by giving strict attention to the papers show an appreciation of the work of the gentlemen who have tried hard to make the literary programme a success.

For myself I can only thank you for the great honor that you have done me in electing me your President. It goes without saying that to be President of an Association in which my father took so much interest, and for which he worked so earnestly, and so faithfully as Secretary, is a source of very great pleasure. I believe that my election to fill this high office must have been due in large measure to the kindly feelings of his friends as well as my own. Whatever the cause I thank you, gentlemen, heartily and sincerely.

On motion of Capt. White, the address was referred to a Committee of three (Messrs. Cowdery, Jourdan and Prichard) for consideration and report.

President Nettleton resumed the Chair and called upon Mr. K. M. Mitchell, of St. Joseph, Mo., to read his paper on

A METHOD SUCCESSFULLY EMPLOYED TO OBVIATE TROUBLE FROM NAPHTHALINE.

The author read as follows:

For ten long years we have battled with naphthaline. That it is a serious problem, which has no satisfactory solution as yet, every gas engineer will concede. In searching for a remedy every suggestion has been followed up in the hope that some way might be opened up to meet the difficulty. We do not claim perfection for the remedy which is outlined in this paper, but we do think that much of the difficulty can be overcome by an intelligent application of the plan in use in St. Joseph. We need not say that the contrivance is original with us, for it is not.

The real trouble began with the erection of our new retort house, condenser, purifier and gasholder. It soon became a serious matter; so much so as to threaten the business of the Company. The fact that an opposition Company, with unlimited resources and an active management, was on the ground, seeking recognition and demanding its share of patronage, made the situation one of the gravest importance. As is always the case where there is active opposition, the public was not at all backward in its demands. It was no uncommon occurrence to be told that our gas was uncertain, and unless we could furnish a uniform light they would be compelled to give the other Company a trial. Not being willing nor prepared to surrender the business of the old Company to the opposition, a series of experiments was begun to meet the difficulty, with what success you must judge when you have made a practical test of the plan.

Naphthaline made itself felt in the inlet to the gasholder and in the consumers' services. As you all know, there are no more vulnerable points of attack than these places, except it be the outlet to the gasholder.

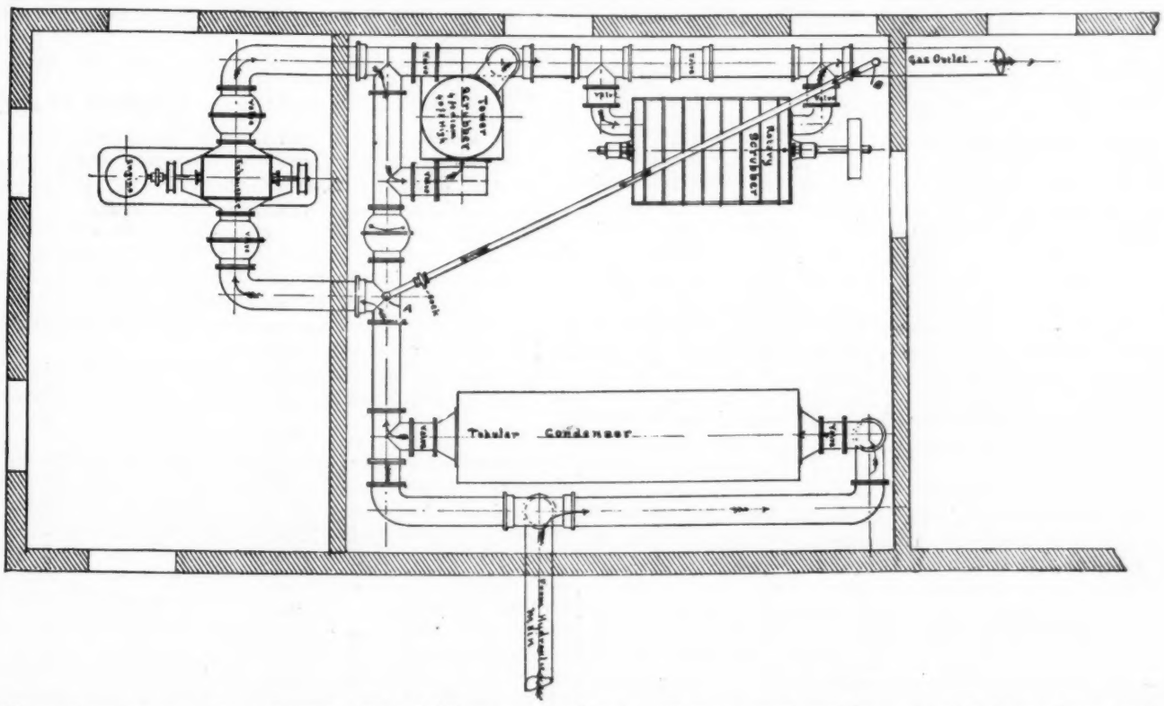
At the gas works the inlet pipe to the gasholder is 20 inches. A hole was drilled in the crown of the gasholder, directly over each of the inlet and outlet pipes. We have many a time attached a string to a plumb bob and dropped it into the inlet pipe, and it would bed itself in the white mass as in a snow bank. Our first plan for clearing was to introduce gasoline into the inlet pipe by means of a small jet injector.

This remedy only transferred the naphthaline from this to another cool spot further along. It also caused the inlet pipe to leak, because of the heating and the cooling, and the consequent contracting and expanding of the metal of the pipe. Another remedy suggested itself. We emptied of its water the last section of our Standard scrubber, and moved the fresh water inlet to scrubber on section forward. The section which was emptied of its water was supplied with 74° gasoline. This remedied the trouble with the inlet pipe to holder, but the trouble continued with the service pipes of the consumer.

While searching for information in my gas journals, I came across the description, in the London *Journal of Gas Lighting*, etc., of a patent taken out by L. Bremond, in 1878, of improvements in means to be employed for preventing the deposit of naphthaline in gas apparatus, mains and fittings. The patent was dated March 13, 1877. The invention is based upon the assumption that dry gas, or gas from which the vapor of water has been wholly or in a great part removed, will not deposit its naphthaline while in a dry or nearly dry state. The invention consists, therefore, in drying the gas after it has left the washers or scrubbers, by passing it through a vessel or vessels of any convenient form containing a substance or liquid which absorbs moisture with avidity, such as chloride of calcium, quicklime, baryta, caustic potash, caustic soda, sulphuric acid, phosphoric acid or other substances or liquids having an affinity for water. By this means the gas was dried; but as most of the vessels through which the gas has subsequently to pass are supplied with water, and as the gas would in passing through come in contact with and absorb water from these vessels, it is proposed that to the water with which they are charged a convenient quantity of oil, of nearly but rather lighter density than water, should be added, so that the gas in its passage through these vessels should be protected from coming into contact with water; in other words, the cup of purifiers, station meter tanks, gasholder tanks, station governor tanks, and, in fact, any other vessel ordinarily containing water, and through which the gas has to pass, should be supplied with oil as well as water, in order to prevent the water from vaporizing and becoming incorporated with the gas. It is also proposed that, after the gas has passed through the station governor and before it enters the mains, it (the gas) should again be passed through a vessel or vessels containing one of the desiccating materials before alluded to, in order to dry or deprive the gas of the vapor of water to the utmost.

Further, it is desirable that all siphons attached to the mains should be supplied with oil to prevent the gas from absorbing moisture from the liquid frequently contained therein.

As an additional safeguard to prevent the deposition of naphthaline



in the fittings of consumers, a box charged with quicklime, or other before named materials, may be connected to the outlet of the meter, and between it and the pipe leading to the fittings and burners. The material may be renewed from time to time, or whenever necessity dictates.

We tried the above plan as far as we could with our existing apparatus, and without entailing too great expense. The top layer of each purifier we charged with quicklime. We covered the water in center seal, station meter and drips with a light oil, so as to keep the gas as free from moisture as we could. The result was a partial cessation of the evil in the inlet to the gasholder, and a slightly better result with the consumers' services. We continued this plan for five years. The trouble seemed to get worse and worse, and we were at a loss to know what to do for a permanent remedy. We were obliged to use 74° gasoline in the inlet of the holder, sometimes using a barrel a day to keep the pipes free. It was almost a daily business, during the fall and winter months, to have a team and wagon loaded with a barrel of gasoline, and a pump with hose attached, to connect with lamp post, so as to pump from the barrel to the mains through the lamp-post. We would select an elevated district so the gasoline would flow back through as great a length of mains as possible. In this way, we worked until, in searching the files of the London *Journal of Gas Lighting*, etc., we came across the paper, read at the meeting of the Eastern Counties Gas Managers' Association, September 16th, 1895, by Mr. R. G. Shadbolt, of Grantham, England, entitled "The Self-Enrichment of Coal Gas."[1]

The system is patented in England, and a description of the process as patented will best show the idea the inventor had in mind.

This invention relates to a method of enriching coal gas during its manufacture by the aid of its own productions.

The patentees, in their specification (which is not illustrated) say: "It is well known that coal gas in the earlier stage of manufacture deposits, in the form of tar, oil, etc., the greater part of its heavy vapors, a small portion of which, if retained, would have material effect upon the resultant illuminating power of the gas; and we claim by our method to retain a portion of these vapors, which would under ordinary treatment be precipitated and absorbed in the tar."

They propose to convey a portion of the partly purified gas—10 per cent. more or less, according to requirements—from a point generally found between the exhauster and purifiers (as usually placed), but varying with local conditions. The place required is "where the gas contains the lighter hydrocarbon or oil vapors after the extraction of the tar, or, in other words, where the gas contains the minimum of tar vapors with the maximum of oil vapors." From this point, taking advantage of the difference in pressures here and at the foul main, if the point be after the exhauster, a portion of the gas is returned to another point, generally found between the hydraulic main and the condensers, the position of this point varying according to the quantity of gas being made. Under normal conditions, and with the maximum make of gas, the returning gas would be introduced somewhere about the condenser inlet, with a small make of gas at a point nearer the retorts, and with the minimum make of gas at a point possibly half way or more back toward the retorts, taking care always that all the tar extracted from the newly made gas is drained off previous to its reaching this point. Generally speaking, the temperature of the gas here will be between 100° and 130° F., although, under normal conditions, the best results are obtained when the temperature is from 120° to 130°, at the point where the return and newly made gases intermingle.

The inventors claim that the old vapors contained in the returned gas prevent the precipitation of a portion of the heavier vapors still retained in the newly made gas, which, if left to ordinary influence, would condense out and be deposited either as liquid or solid. These heavier vapors are saturated or blended with oil vapors of the returned gas; and this being done in the presence of marsh gas, they are carried forward away from condensing influence of vapors already become liquid, and subsequently become fixed in the finished gas. Under certain conditions (extreme cold, etc.), it is sometimes advisable to slightly raise the temperature of returning gas; and, when necessary, this would be done by means of steam-jackets, hot air-jackets, or other equivalent means.

The returning gas is conducted by ordinary pipes properly fixed, drained, etc., to a meter suitable in size and construction, where it is duly measured and conducted through one or more of the three or more branches to the point selected, as before mentioned.

We were skeptical of the arrangement at first, but resolved to try it, as it seemed to be inexpensive. We quickly connected the pipes together as shown on the sketch. We drilled holes, marked *A*, for 2-inch pipe at the outlet of the condenser and before the exhauster. We also drilled a hole, morked *B*, in the pipe, after the standard or rotary scrubber. We connected these two openings together with a 2-inch gas pipe, so that the gas, after passing through the exhauster and a tower scrubber, 4 feet in diameter and 50 feet high, filled from bottom to top with slats 1½ inch square, spaced ¼ inch apart, and then into the rotary scrubber, was caused to return and pass over and through the exhauster, tower and rotary scrubbers. The pressure at the outlet of the scrubber was 7 inches, and the pressure at the inlet to the exhauster was nil. We calculated that about 8 per cent. of the gas was returned to the exhauster to be pushed through the two scrubbers again. The result was magical. The candle power of the gas showed a decided increase. The pressure gauge, which indicated at the inlet of gasholder 60-tenths pressure, dropped to its normal height of 40-tenths before the next morning.

We have been entirely free from naphthaline for 10 months. We have been obliged to discontinue the use of the pipe, on account of the small size of the exhauster we have in use.

1. See JOURNAL, Oct. 12, 1896, p. 563.

The system requires that 8 to 10 per cent. of the partially purified gas be returned to the inlet of the exhauster. Our experience with the process has been in this practical way. The candle power of the gas was increased from 16 to 17¼, and the deposit of naphthaline entirely prevented. We have not experimented as to a better location for the return pipe, as Mr. Shadbolt seems to have had some difficulty in locating in one of his experiments where the gas shou'd be brought from, or from what point in the system, after the gas had passed the exhauster, it should be taken. Neither did we experiment as to the quality of the tar after the pipe had been connected. What we do know is that where we were once greatly troubled with stoppages from naphthaline, now, by the small expense of a return pipe from one point of the apparatus to another, the trouble is entirely removed. We have no other desire in presenting this paper to the Association than to help our brother gas managers, if perchance they are in the same trouble we were, to put themselves in a way to cheaply and surely get relief from naphthaline.

We have copied from Mr. Shadbolt's paper the analysis and report of two samples of tar, marked A and B, received from Mr. Shadbolt, gas works, Grantham.

"Both samples of tar were thin and of light specific gravity, being drawn from gas condensers; sample "A" being the tar produced in the condensers in the process of ordinary working; sample "B" being the tar produced in the condensers during the process of enrichment to the extent of 1¼ candles.

(The specific gravity of ordinary tar, 1,180–1,200.)

	Sample "A."	Sample "B."
Specific gravity, water, 1	1.135	1.134
Produced by weight	per cent.	per cent.
Water	1.90	1.74
Crude naphtha	8.10	7.57
Light oil	9.26	7.26
Creosote	25.57	22.00
Anthracene and heavy oils	21.48	19.35
Pitch	33.00	41.30
Loss	0.69	0.78
	100.00	100.00

"The distillation was carried to the same point in each sample. Commercially there is little difference in the value of the two tars. There is a small but distinct difference in the percentage of the lighter oils; sample "A" being slightly richer in benzols than "B," while the "B" sample contains a much higher production of pitch.

"The samples dealt with were too small to permit of the determination of the quantities of pure anthracene and carbolic acid, which, however, would not materially affect the relative commercial value of these tars.

"(Signed), W. R. CHESTER."

From the foregoing report, remembering that the tar analyzed represented only 15 per cent. of the total quantity made, and that consequently the differences must be divided by 6⅔ to arrive at their total effect, we may safely conclude that the loss in value is infinitesimal, and may be dismissed as a negligible quantity. In fact, greater differences than these exist between the tar produced from two different coals in the ordinary way. The only real loss may be said to be in quality, and may perhaps be the most easily arrived at from the pitch basis.

In comparing the two analyses, we notice that the proportion of pitch contained in sample "B" is 41.30 per cent., by weight, against 33 per cent. in sample "A;" being an increase of 8.30 per cent., on the bulk, which practically represent the loss of oils, due to the enrichment process, and made up as follows:

Loss Due to Enrichment.

Crud naphtha	0.53	per cent.
Light oil	2.00	"
Creosote	3.57	"
Heavy oils, etc	2.13	"
Total	8.23	per cent.

For all practical purposes, therefore, we may take it that the loss in quantity is equal to 8.3 per cent. of the condenser tars as variously expressed below:

8.3 per cent. of condenser tars absorbed per 1¼ candle per 10,000 cubic feet enrichment.

1.245 per cent. of total tar made absorbed per candle per 10,000 cubic feet enrichment.

0.996 per cent. of total tar made absorbed per candle per 10,000 cubic feet enrichment.

0.0996 gallons of tar used absorbed per candle per 10,000 cubic feet enrichment.

Cost per candle per 10,000 cubic feet, tar at $6 per ton, 0.3 cent.

We are aware that it has been the practice to take from the gas the troublesome naphthaline, and expensive experiments have been made to accomplish this end. Our judgment is the naphthaline should be kept in the gas, as it is a powerful illuminant.

Mr. George Livesey, in the year 1896, said, in the course of a discussion on the enrichment of coal gas, "They had in this substance the most splendid illuminant, and they had been hitherto anxious to get rid of it. If means could be found whereby the gas would be able to carry it, it would be one of the most valuable contributions they had had to the improvement of gas lighting."

We have seen how this experiment has helped us and we heartily recommend the arrangement as a long step in the right direction.

Discussion.

The President said the paper was on a live topic, and he thought all would agree with him that Mr. Mitchell had done much in the direction of assisting his hearers to surmount a troublesome foe. The President then asked Mr. Ramsdell to speak to the question.

Mr. Ramsdell thought he could say but little that would be of interest in the premises, further than to admit that he had a long and unpleasant acquaintance with naphthaline accumulations. He thought that if, as Mr. Mitchell said was the case, the plan followed at St. Joseph was successful, there was no reason why it should not be successful elsewhere. He further thought that the dimension of the pipe used was small. Mr. Mitchell's plan not only had the merit of relieving his works from naphthaline stoppages, but also caused an enriching of the gas as well.

Mr. W. Forstall asked Mr. Mitchell if he increased the temperature of the returning gas, and what the dimensions of the works' connections were.

Mr. Mitchell replied that the gas at exhauster was not far from a temperature of 100°. The temperature of the gas on its return was just as it came on normally. The works' connections were 16-inch. The return pipe dimension was adjusted to deliver the 8 per cent. of gas on the return.

Mr. Littlehales asked if Mr. Mitchell thought the removal of the moisture from the gas was the secret that caused it to absorb additional hydrocarbon.

Mr. Greenough asked Mr. Mitchell if the coal used was of equal grade as a rule. Also, if the yield per pound and per bench was fairly even during the trials.

Mr. Mitchell replied that their condenser was so arranged as to have the gas pass over as small a condensing surface as possible. He thought that ordinary condensation had a tendency to remove benzol from the gas. They tried to keep the gas at about 100° at the exhausting point. They used Southern Kansas coal, which yielded not far from 8,000 cubic feet to the short ton. It was very sulphurous, but the candle power was perhaps a trifle better than that yielded by Pittsburgh coal.

The Secretary thought Mr. Mitchell's plan was in effect that which many who operated an auxiliary water gas plant had been trying for years, when the naphthaline season came round. In Newark, the pest usually made its appearance in August or September, or both months. To lighten their difficulties they passed on some oily vapors or unfixed gas to go on to the supply mains, in the belief that such vapors would soften the naphthaline deposits.

[Mr. Forstall continued at some length with a very interesting statement in detail over the matter at issue. In justice to ourselves and to our readers and to the speakers, we will not attempt to report further the discussion, which we have been permitted to take only in the shape of long hand notes. It is too technical to be so fairly reported. Other speakers who took part in the debate were Messrs. F. C. Sherman, Robert Young, J. Somerville, E. H. Jenkins, F. Egner, G. B. Neal, T. Littlehales, C. J. R. Humphreys, R. M. Searle, A. S. Miller, H. H. White, E. G. Pratt, G. T. Thompson and C. Watson.—EDS.]

On motion of Mr. Thompson a vote of thanks was passed to Mr. Mitchell.

The President then appointed Messrs. A. S. Miller, Wm. McDonald and E. H. Jenkins a committee to name place for holding the next annual meeting.

A recess to 2:30 P.M. was then ordered.

ROLL CALL

disclosed the presence of the following:

Honorary Members.

Barker, F. E., Boston, Mass.
Foote, A. R., Tacoma Park, D. C.

Active Members.

Africa, W. G., Manchester, N. H.
Barret, A. H., Louisville, Ky.
Barrett, W. E., Ardmore, Pa.
Baxter, I. C., Detroit, Mich.
Baxter, W. H., Petersburg, Va.
Beadle, A. B., Philadelphia, Pa.
Beal, T. R., New York City.
Beal, W. R., New York City.
Betts, E., Wilmington, Del.
Blodget, C. W., Brooklyn, N. Y.
Borgner, C., Philadelphia, Pa.
Bowen, W. S., Newport News, Va.
Bredel, F., Milwaukee, Wis.
Brown, E. C., New York, N. Y.
Buckman, J., Philadelphia, Pa.
Burke, J. E., Princeton, N. J.
Bush, J. S., New York City.
Callender, E. P., New York City.
Capelle, G. S., Wilmington, Del.
Cartwright, W., Philadelphia, Pa.
Cathels, E., Hamilton, Ont.
Chollar, B. E., St. Louis, Mo.
Collins, J., Port Jervis, N. Y.
Corbett, C. H., Brooklyn, N. Y.
Cowdery, E. G., Milwaukee, Wis.
Cressler, A. D., Fort Wayne, Ind.
Curley, T., Wilmington, Del.
Daly, D. R., Jersey City, N. J.
Daniels, J. M., Columbia, S. C.
Dell, J., St. Louis, Mo.
Diall, M. N., Terre Haute, Ind.
Dickey, C. H., Baltimore, Md.
Dickey, R. R., Dayton, O.
Doty, P., Long Branch, N. J.
Egner, F., Norfolk, Va.
Eilbeck, A. B., Philadelphia, Pa.
Faben, C. R., Jr., Toledo, O.
Ferrier, J., Columbus, Ga.
Flemming, D. D., Jersey City, N.J.
Floyd, F. W., New York City.
Forstall, A. E., Montclair, N. J.
Forstall, W., Lockport, N. Y.
Fowler, J., Philadelphia, Pa.
Fry, C. C., Lynn, Mass.
Gandey, A. C., Lambertville, N. J.
Gates, F. W., Hamilton, Ont.
Greenough, M. S., Cleveland, O.
Gribbel, John, Philadelphia, Pa.
Hambleton, F. H., Baltimore, Md.
Harbison, J. P., Hartford, Conn.
Harper, G. H., Altoona, Pa.
Harris, J. A., Philadelphia, Pa.
Herron, J. T., Buffalo, N. Y.
Humphreys, A. C., New York City.
Humphreys, C. J. R., Lawrence, Mass.
Jenkins, E. H., Covington, Ky.
Jourdan, J. H., Brooklyn, N. Y.
Kellogg, L. L., Sioux City, Iowa.
Keppelman, J. H., Reading, Pa.
Knowles, W. P., Richmond, Va.
Leach, H. B., Taunton, Mass.
Learned, C. A., Meriden, Conn.
Learned, E. C., New Britain, Conn.
Learned, W. A., Newton, Mass.
Littlehales, T., Syracuse, N. Y.
Littleton, A. W., Quincy, Ill.
Ludlam, E., Brooklyn, N. Y.
Lynn, J. T., Detroit, Mich.
Macdonald, B. J., Newburgh, N.Y.
McCullough, E. H., Philadelphia, Pa.
McDonald, W., Albany, N. Y.
McElroy, J. H., Pittsburg, Pa.
McIlhenny, J. S., Washington, D.C.
McIlhenny, J., Philadelphia, Pa.
McIlhenny, J. D., Philadelphia, Pa
Middleton, R. L., Washington, D.C.
Miller, A. S., Long Island City, N.Y.
Miller, C. O. G., San Francisco, Ca'.
Miller, W. A., Cincinnati, O.
Milsted, W. N., New York City.
Mitchell, K. M., St. Joseph, Mo.
Morton, Fred N., Hoboken, N. J.
Moses, F. D., Chicago, Ill.
Neal, G. B., Charlestown, Mass.
Nettleton, C. H., Derby, Conn.
Nute, J. E., Fall River, Mass.
Page, C. H., Jr., Philadelphia, Pa.
Page, F. D., Fitchburg, Mass.
Payne, M. J., Kansas City, Mo.
Pearson, W. H., Jr., Toronto, Ont.
Perkins, J. D., New York City.
Pinkney, E. A., Utica, N.Y.
Pratt, E. G., Des Moines, Iowa.
Prichard, C. F., Lynn, Mass.
Quinn, A. K., Newport, R. I.
Ramsdell, G. G., Philadelphia, Pa.
Rice, H. L., Norfolk, Va.
Ringwood, T., Ilion, N. Y.
Roots, D. T., Connersville, Ind.
Rowland, C. L., Brooklyn, N.Y.
Rowland, W. L., Philadelphia, Pa.
Russell, D. R., St. Louis, Mo.
Russell, H. Z., Honesdale, Pa.
Searle, R. M., Atlanta, Ga.
Shelton, F. H., Philadelphia, Pa.
Sherman, F.C., New Haven, Conn.
Slater, A. B., Providence, R. I.
Smith, W. H., Bayonne, N. J.
Somerville, J., Indianapolis, Ind.
Stacey, W., Cincinnati, Ohio.
Thompson, G. T., New York City.
Thwing, O. O., St. Louis, Mo.
Voorhis, A. M., Nyack, N.Y.
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Walters, A. H., Johnstown, Pa.
Ward, W. H., Easton, Pa.
Warmington, D. R., Cleveland, O.
Warmington, G. H., Cleveland, O.
Watson, C., Camden, N. J.
Weber, O. B., New York City.
Wehner, A. F., New York City.
Wheeler, F.B., Long Branch, N.J.
White, H. H., Portsmouth, Va.
White, W. H., New York City.
Williams, E. H., Waterbury, Conn.
Williams, W. L., Paterson, N. J.
Wood, A. C., Syracuse, N. Y.
Young, J., Allegheny, Pa.
Young, R., Allegheny, Pa.

Associate Members.

Collins, D. J., Philadelphia, Pa.
Crane, W. M., New York City.
Eaton, A. B., Chicago, Ills.
Hayward, S. F., New York City.
Henderson, E. H., Pittsburgh, Pa.
Knight, C. S., Fort Wayne, Ind.
Mansur, J. H., Royersford, Pa.
Mather, H. A., Brooklyn, N. Y.
McDonald, D., Albany, N. Y.
Mordue, T. N., New York City.
Page, A. L., New York City.
Persons, F. R., Toledo, O.
Roper, G. D., Rockford, Ills.
Starr, G. W., New Haven, Conn.
Van Wie, E. G., Detroit, Mich.
Van Wie, P. G., Hamilton, O.
Wells, F. K., Chicago, Ills.
Wharton, H., Philadelphia, Pa.

[To be Continued.]

The Distribution of Gas.

[Contributed by MR. D. COATS NIVEN, of Calcutta, India, to the *Journal of Gas Lighting.*]

The subject of the distribution of gas is, I consider, of primary importance to a gas manager, and yet it is rarely tackled at gas meetings. It is therefore refreshing to find two papers on the subject—one in America, the other in England. The American writer states that the formula required for ascertaining the quantity of gas delivered is as follows:

$$Q^2 = \frac{D^5 H}{0.0000006 s L}$$

The letters denote the usual factors. There is no doubt that the formula has the appearance of something new; but, on inspection, I find that it is only an old friend in a new dress. The explanation is that the long decimal is equivalent to a vulgar fraction, the reciprocal of which is $(1,290)^2$. Accordingly, the equivalent formula is—

$$Q^2 = \frac{(1,290)^2 d^5 h}{s l}$$

But this formula simplified is thus—

$$Q = 1,290\, d^2 \sqrt{\frac{d\, h}{s\, l}}$$

To test the comparative facility of application of this simplified formula and the American's decimal formula, suppose I want to know the delivery of gas from a 4 inch main at 900 yards, omitting pressure and specific gravity, then—

$$Q = 1,290 \times 4^2 (d^2) \times 2 (\sqrt{d}) \div 30 (\sqrt{l})$$

$$1,376 = \frac{1,290 \times 16 \times 2}{30} = \frac{41,280}{30} = 1,376.$$

This is so simple that it might be done mentally. The decimal formula for time could be called a schoolboy's exercise.

The American has changed the 1,350 coefficient to 1,290, and giving a long decimal fit for no practical work. Granted, there is shown a little arithmetical manipulation, which may be called "cuteness." When he speaks of *pumping* air into pipes to test them, I think that Braddock and Cowan could give him some information regarding a force meter.

The English essayist has got the impression that a number of gas managers have incorrect views about the size of pipes; and he has taken upon himself the very laudable task of instructing them: He says: "With reference to the replacing of one main by another of larger diameter, a fallacy exists in some quarters that the supplying capacities of the mains vary as the squares of their diameters. As a matter of fact, the capacity variation is as the square root of the fifth power of the diameter expressed by the formula: Relative discharging capacity of pipes $= \sqrt{d^5}$. As an example of the application of the above formula, a 12-inch main under 2 inches pressure delivers 33,600 cubic feet of gas per hour at the end of 2,000 yards. It is required to find what a 14-inch main under the same conditions will deliver. The square roots of the fifth powers of the diameters (12 and 14) are as $1 : 1.47 \therefore 33,600 \times 1.47 = 49,392$ cubic feet, the discharging capacity required. The figure given in Mr. Barlow's tables for corresponding conditions is 49,400 cubic feet." To analyze the paragraph quoted is to state: (1) That there is the assertion that an error about gas delivery in pipes lurks in the minds of a number of gas managers. (2) That the rule as brought forward for the capacity of pipes in delivery should be applied.

Now, while reading this lucubration of the essayist, I thought that it was not unimportant to know something of the history of a subject prior to its treatment. Had the essayist done so, he would have found that in 1853 Dr. Pole's essay on the motion of elastic fluids through pipes was contained in Clegg's "Treatise on Coal Gas." Further, that Mr. Barlow's tables simply concretely illustrated Dr. Pole's essay. It is common property, as shown in King's "Treatise," and in Richards' and Newbigging's works. In Hurst's "Architectural Handbook," it is stated as a long well-known fact "that the relative capacity of pipes for supplying gas varies as $\sqrt{d^5}$." Since this principle is embodied in all text books on gas, and since the most ignorant gas manager (who must, of course, employ Mr. Barlow's tables) can at a glance, on the least comparison, verify the principle, I ask: Is it not conceited impertinence to assume that a number of gas managers are so ignorant? At all events, the assertion of the essayist is groundless, and a pure assumption.

Now for the rule. He evidently thinks it is new. But $\sqrt{d^5} = d^{\frac{5}{2}} = d2\frac{1}{2} = d^2 \sqrt{d}$; and this is part of the old formula. Therefore there is nothing new in it. Still it may be said that $\sqrt{d^5}$ is easier of application. Let us take his own illustration. The fifth power of 12 is 248,832; and the fifth power of 14 is 537,824. The square root of 248,832 is 498; and of 537,824 it is 733. But divide 733 by 498, and the quotient is 1.47, which multiplied by the 33,600 cubic feet gives 49,392. So much for the so called new rule in working.

Now, try the old rule, thus: $d^2 \sqrt{d}$. The square of 12 is 144, and multiplied by the square root of 12 or 3.46, the total is 498. The square

of 14 is 196, and multiplied by the square root of 14, or 3.74, the total is 733; and 733 ÷ 498 = 1.47, the answer required.

The simplicity of the old rule in working is the reason why it, and no other, is applied. In such matters, every man has his own short and easy method; and, I may say I do all my distribution problems mentally. But if I had figures to work with, as suggested by the rule to be applied of the English essayist, I should require a clerk to work out my calculations. I do not wish to be considered churlish, or discouraging to essayists; but, as the result of hard study for years, I would suggest that simple subjects should at first be grappled, and the strength thus acquired will equip writers for others more complex.

During the past years, I have noticed, in the excellent addresses given by our most able gas experts, some books recommended for study and application. But, in my experience, there is one book which is never pointed out, and that is on "Logic." If you consider that logic is called the "science of sciences and the art of arts," it must be plain that, unless there be good natural ability, there will be more or less failure of the proper and effective application of the knowledge a man may possess. To test a proposition, natural routine may do much; but to give confidence in testing it, logic is one's only friend. It destroys all rambling or irrelevancy, and enables a man to make the best use of his capacity. I admit that in the old country logic is not so essential as it is here; for there, if one is in trouble, a hundred are ready to help him out, whereas here there is no help. Hence I fall back on the confidence given me by logic, in the same way that a boxer falls back upon his confidence in fence should he be attacked by powerful odds against him. In my opinion, a man who wishes to be a gas manager abroad should, besides possessing the necessary qualifications, be a logician; for if he is, he will have less trouble and annoyance in his daily routine of procedure.

Action of the Bunsen Burner.

Prof. V. B. Lewes, in a lecture before the Society of Arts (London), said, in explaining the action of the cylindrical type of Bunsen burner:

In a Bunsen burner the chemical action which gives rise to the heating consists of two distinct combustions. The first takes place on the surface of the inner visible cone of the flame. Here the hydrogen and hydrocarbons of the coal gas undergo a partial combustion at the expense of the oxygen of the air, which has been previously mixed with the coal gas. This results in the combustion of the carbon to a mixture of carbon monoxide and dioxide, while some of the hydrogen is burned to water vapor. The outer flame is produced by the combustion of the hydrogen and carbon monoxide, escaping from the inner zone into the completed products of combustion, carbon dioxide and water vapor.

The characteristic appearance of the Bunsen flame varies according to the amount of air which is allowed to enter with the gas. Under normal conditions the zones of flame have a violet blue color, while as more and more air is allowed to enter with the gas the flame becomes fiercer and the inner zone acquires a green tint, and a still further addition of air causes the mixture to become so highly explosive that it flashes back into the tube of the burner. During this change in the color of the flame alterations are taking place in the temperature which the various parts of flame are emitting. The following table gives an approximate idea of the increase that takes place with the addition of more and more air, and which reaches its maximum as an explosive limit is approached:

Temperatures of Bunsen Flame with Blue and Greenish Inner Cones.

	Blue Inner Cone.	Greenish Inner Cone
Tip of inner cone	1,090°	1,575°
Center of outer cone	1,533°	1,630°
Tip of outer cone	1,175°	1,545°
Side of outer cone, level with tip of inner cone	1,333°	1,511°

The ratio of gas to air in the blue and greenish non luminous combustion is about, in the blue, 1 volume of gas to 2.27 of air, and in the green, 1 volume of gas to 3.37 of air.

The reason of this increase of temperature is that the less air that is supplied to the center of the flame the more has to be introduced from the exterior, and while the interior supply has been heated in its passage up the hot tube and by partial combustion in the inner zone, the outer supply is cold; and as not only the oxygen which is used by the flame, but also four times its volume of diluting nitrogen, has to be heated, it is manifest that the less external air that is sucked into the flame the higher will the temperature of the external portion of the flame become; and as it is this part of the flame which is utilized for heating incandescent mantles, it is clear that this will give a gain in the amount of light to be obtained from the mantle itself.

In the Bandsept burner it is possible to so regulate the mixture of the air and gas that not only is the green zone in the interior of the flame formed, but owing to the explosive point being reached it is drawn down on to the surface of the top of the gauze forming the atomizers, or mixers, through which, however it is unable to pass. The flame then consists of what is, practically, only the outer cone of the ordinary Bunsen, and, being fairly homogenous, has a greater equality in temperature than can be obtained with the ordinary flame.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Rufus J. Foster, of the editorial staff of the *Colliery Engineer and Metal Miner*, of Scranton, Pa., informs us that, beginning with the November number, the title of that publication will be changed to *Mines and Mining*. In further remarks on the change, Mr. Foster says: "There will be no change in the ownership nor in the editorial management. The form and size of the publication will remain the same, and the policy of taking advantage of every opportunity to improve it will be continued. The new name has been adopted because it expresses better the scope of the publication than the old one."

The election for Trustees in the Troy (N. Y.) Gas Company resulted as follows: A. E. Bonesteel, A. Bleecker Banks, Anthony N. Brady, Thos. Breslin, Fred. E. Draper, James Fleming, S. O. Gleason, George P. Ide, William Kemp, Francis J. Molloy, Edward Murphy, Jr., R. C. Pruyn and W. A. Thompson.

According to statistics submitted by the Kansas City, Missouri, Gas Company, furnished when the application to list the new bond issue on the New York Stock Exchange was made, the Company, on June 1, 1897, had in service 19,105 separate meters. The cooking and heating appliances in use numbered 24,498; the street lamps numbered 1,647.

Mr. Ellis F. Michael, for a long time prominent in the La Porte (Ind.) Gas and Coke Company, died at his home in La Porte about a fortnight ago. Deceased, who was in his 72d year, had been prominent in the business, political and social affairs of La Porte county and city for almost a half century.

The proprietors of the Eau Claire (Wis.) Gas Light Company have put up a specimen installation of Welsbach lamps for street lighting in that city. South Farwell street, opposite the Third Ward Park, was the stretch chosen for the illustration of the illuminating capabilities of the lamps, and so far both Company and residents are well pleased with the trial.

The Council of Richmond, Va., is considering the advisability of reducing the gas rate for fuel service to 90 cents per 1,000 cubic feet. Superintendent Knowles favors the project, and it also seemingly has the support of the Committee on Light.

The proprietors of the Virginia Hotel, Kansas City, Mo., which hostelry requires a 150-light meter to measure its gaseous needs, having conceived the idea that their meter was fast, applied to the official gas inspector for the city (Mr. F. McClure) for a test of the suspected instrument. The inspector complied with the request, and the hotel men in due time received a certificate attesting to the fact that the meter was one-half of 1 per cent. slow.

The Milwaukee (Wis.) *Journal* says that the latest Canadian grievance against Americans concerns the piping of Canadian natural gas across the frontier for consumption in the United States. Already nine tenths of the product of certain Canadian gas wells, valued at $5,000,000 a year, is piped across the boundary into the United States. The contention is made by would-be consumers in Canada that the industry is being absorbed gradually by United States Companies who have bought out the interests of Canadian incorporators, and an agitation is in progress to have the further export of the gas prohibited.

A special election was recently held in Carthage, Mo., the ballot having been upon a proposition to bond the city in the sum of $28,000, the proceeds of the issue to be devoted to the establishing of an electric lighting plant to be operated on municipal account. The total vote cast was 768; for, 405; against, 363. The bye-law required that the proposition should receive at least two-thirds of the vote cast.

MR. L. F. MCCLURE, the gas inspector for Kansas City, Mo., reports that the quality of gas supplied by the Kansas City, Missouri, Gas Company is always well above the stipulated requirement of the ordinance under which the Company works.

THE sale of the property and franchises of the Nashville (Tenn.) Gas Light Company has not been completed—that is, it had not been consummated last Monday. In fact, the opposition to the scheme is gathering strength.

AT a special meeting of the Trenton (N. J.) Common Council, held October 22, the ordinance granting a franchise to the proposed Peoples Gas Improvement Company, was advanced to a third reading, but not until several amendments, offered by Mr. Case, Chairman of the Ordinance Committee, had been made to it. The amendments provide that the price of gas to the public shall not exceed $1.50 per 1,000 cubic feet; that in the arrangements which the Company may make with contractors in charge of city pavements, nothing in the ordinance shall be construed to relieve the contractors of their guarantees, and that the Company shall not consolidate with any other Company, or lease its works under a penalty of forfeiture of the charter. On the amendment to make the price of gas $1.50 instead of $1.25, a *viva voce* vote was taken, several members declaring in the negative. Those who voted for the amendment say that the $1.50 rate is a fair one for a city of the size of Trenton, and that "the competition of rival companies may bring it lower." The understanding is that the ordinance will be finally disposed of at an early date.

THE Collins Company, of Collinsville, Conn., in order to better its facilities and to meet the demands of its increasing business, is making extensive improvements in its plant at Collinsville, and has placed a contract with the Berlin Iron Bridge Company, of East Berlin, Conn., for a large addition to the forge shop. The new construction will be entirely of iron, in order that it may be altogether fireproof.

MESSRS. JAMES R. FLOYD & SONS, of 531 to 543 West 20th street, and 530 to 540 West 21st street, New York, have issued a circular to the trade, under date of October 14, the text of which is as follows:

"After a business career of 42 years, our senior partner, Mr. James R. Floyd, has decided to retire; and the firm of James R. Floyd & Sons has, therefore, been dissolved by mutual consent.

"The business will hereafter be carried on by Mr. Frederick W. Floyd, Mr. Henry E. Floyd, and Mr. James R. Floyd, Jr., under the firm name of James R. Floyd's Sons.

"Trusting we may merit the continuance of your favors, we remain, yours truly, JAMES R. FLOYD'S SONS."

THE successive changes in the business name of this sterling house may thus be succinctly stated: Herring & Floyd, 1856; James R. Floyd, 1881; James R. Floyd & Sons, 1888; James R. Floyd's Sons, 1897.

THE Rockville (Conn.) Gas and Electric Light Company is making a notable addition to its main system.

A SUIT for damages, recently brought in the Middlesex County Superior Court, sitting in East Cambridge, Mass., by W. R. T. Burditt, of Lexington, Mass., against the Lexington Gas Company, has attracted some attention on account of the oddity of the claim. The plaintiff asserts that the defendant negligently left a wire hanging over and on a certain portion of Main street, Lexington, December 13, 1892. One end of the wire was attached to a post; the other end of the wire was lying on the street. On the day mentioned plaintiff's horse was thrown to the ground, through contact with the wire, and plaintiff was thrown to the roadway. In his fall he struck an iron pulley block left in the street by defendant. He sustained a fracture of the skull, and other injuries received at the same time and by the same means have caused permanent physical disabilities. He asks for $30,000 damages. The answer of defendant was that plaintiff was driving through the street at a pace faster than that permitted by the by-laws of Lexington, wherefore his fall was due to his own negligence; further that, subsequent to the injury, plaintiff, for a valuable consideration, released the Company from all liability. Mr. Sherman was the trial judge, and we have not been advised of the final disposition of the case.

WE understand that Mr. G. W. Benedict, of Cincinnati, has accepted the ordinance recently granted him by the City Council, of Georgetown, Ky., under which he proposes to erect and operate a gas plant in Georgetown.

AT a recent meeting of the Directors of the Easton (Pa.) Gas Company, Mr. Jeremiah Anglemeyer was elected to the vacancy in the Board that occurred through the death of Mr. William A. Seitz.

SUPERINTENDENT JOHN W. REILLY, of the Wilmington (N. C.) Gas Light Company, has arranged with the Atlantic Coast Line Railway to construct a spur from its tracks into the gas works' yards. The track is to be elevated so that the gas coal supplies may be delivered by gravity into the storage bins. The electrical plant, respecting the incandescent division thereof, is also to be enlarged.

THE natural gas supply of Utah, particularly in the Salt Lake City district, is showing unmistakable signs of exhaustion.

AT the annual meeting of the Consumers Gas Company, of Toronto, Canada, the officers chosen were: Directors, S. Alcorn, M. Baldwin, G. S. C. Bethune, H. Cawthra, G. R. R. Cockburn, Isaac C. Gilmor, George Gooderham, James Henderson, Thomas Long, Dr. L. W. Smith, F. Smith and Thomas Wood—Mr. Long was named to fill the vacancy occasioned by the death of Mr. James Austin; President, Dr. Larratt W. Smith; Vice-President, Hon. Frank Smith; Secretary and General Manager, W. H. Pearson.

MR. C. R. COLLINS, Manager of the Seattle Gas and Electric Light Company, has arranged with the local authorities to make an extended demonstration of the value of the improved Welsbach outdoor lamp and lantern for street lighting purposes. At least 50 lamps will be used in the initial demonstration.

THE Joint Committee on Finance and Gas, of Philadelphia's City Councils, has reported in favor of accepting the proposition for the lease of the Philadelphia municipal gas works submitted by the proprietors of the United Gas Improvement Company.

THE following "official notice" is published as indicative of the process and way under which a gas franchise can only be obtained in California under the operation of the applying laws of that State:

Notice is hereby given that application has been made to the Board of Trustees, of the town of Palo Alto, county of Santa Clara, State of California, for a franchise to lay gas pipes upon the public streets of said town and supply the inhabitants of said town with gas for lighting, heating and cooking purposes, and said Board proposes to grant the same upon the terms hereinafter set forth, viz.: Said franchise shall be for ten years from and after the granting thereof, subject to the right of said town to control rates and to establish a municipal plant for like purposes.

Sealed bids will be received at the office of the Town Clerk, addressed to "H. W. Simkins, Town Clerk, Palo Alto," and marked "Bid for Gas Franchise," up to the hour of 7 o'clock P. M. on the 4th day of December, 1897, and at the regular meeting of said Trustees at 8 o'clock P.M. on said day, or adjournment thereof, said bids will be opened, and said franchise awarded to the highest bidder on or before December 10, 1897. No bids will be received of a single sum or amount stated, but all bids must be for the payment in lawful money of the United States of a stated per cent. the gross annual receipts of the awardee of the franchise arising from the use, operation or possession, payable annually, and shall in no case be less than 3 per cent. per annum upon such gross receipts. Each bidder must accompany his bid with his bond to the said town in the sum of $5,000 United States gold coin, with at least two good and sufficient sureties, to be approved by said Board, conditioned that such bidder shall well and truly observe, fulfill and perform each and all of the terms, conditions and obligations of such franchise, in case the same shall be awarded to him, and that in case of any breach of condition of such bond, the whole amount of the penal sum therein named shall be taken and deemed to be liquidated damages and shall be recoverable from the principal and sureties upon said bond.

Each bid shall also be accompanied by a certified check for $500 payable to the order of the Chairman of said Board. If the bond of the highest bidder is not satisfactory to said Board and is not within 20 days after demand by said Board made satisfactory, said check shall be forfeited to the town. Within 60 days after the award of the franchise the awardee must have his plant in active operation or the franchise shall *ipso facto* by the lapse of time be forfeited without further action by said Board. Each bid must be accompanied by detailed plans and specifications of the proposed plant. Said franchise shall be subject to all ordinances of the town. The Board reserves the right to reject any and all bids. By order of the Board of Trustees of the Town of Palo Alto,

H. W. SIMKINS, Town Clerk.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

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England—Aug. Siegle, 30 Lime Street, London.

MONDAY, NOVEMBER 1, 1897.

A Seventy Thousand Horse Power Central Station.

The *Scientific American* says that work is progressing upon a building in New York city which will contain the largest aggregation of motive power ever gathered together in a single plant. Hitherto that distinction has belonged to the great ocean steamships, the largest power at present being in the engine rooms of the "Campania" and "Lucania," of the Cunard line, each of which is credited with a maximum horse power of 33,000. In this connection it is interesting to note that the huge industrial establishments to be found in the textile and iron industries, with their miles of shafting, their vast power driven machinery and their employees numbered by the thousand, do not call for one-half the motive power that is to be found snugly stowed away in the engine room of a "St. Paul," a "Lucania," or a "Kaiser Wilhelm der Grosse."

The new power house is being built by the Metropolitan Street Railway Company, of New York, and it forms part of the scheme for introducing electric traction on the whole of the 218 miles of street railways owned or controlled by this Company. At present there are three different systems at work: The cable, the underground trolley and the horse car. The mechanical power is supplied from four power houses: A cable power house on Houston street and Broadway, another at 50th street, a third on East 26th street, and an electrical power station at 146th street. The first three of these furnish power for the Broadway and the Lexington avenue cable roads, and the last furnishes current for the Lenox avenue underground trolley.

Work is now well advanced on the 55 miles of horse car lines which are being equipped with the underground trolley, and for the present the necessary electrical power will be furnished from the 146th street and East 26th street stations, the generating capacity of the former station being increased and a new electrical equipment being added at the East 26th street station.

The many advantages to be gained by operating the whole of their vast system by one method of traction, and the uniformly good results which have been obtained on the experimental electric line on Lenox avenue, have determined the Company to make arrangements for equipping the whole 218 miles with the underground trolley. The advantages of economy to be gained by concentrating the power plant at one great central station are many and obvious, and it is this consideration that has led to the planning of the monumental power station which is now under construction near the East River between 95th and 96th streets.

The economical distribution of current from one central station will be rendered possible by the use of a high potential in place of the 550-volt distribution which characterized the practice of a few years ago.

The building will cover a site measuring 201 feet by 270 feet. The foundation will consist of 8,000 piles, upon which will rest a 5-foot bed of concrete, which will extend over the whole area of the site. The building will be divided by a central wall into a boiler house and an engine room. The former will be four stories, and the latter two stories in height. The three lower stories of the boiler house will contain 87 water tube boilers, with a maximum capacity of 800 horse power each, and arrangements will be made for the use of forced draught. The upper third of the boiler house will be devoted to a set of huge storage bins, with a combined capacity of 9,000 tons of coal. The coal will be transferred from barges at the adjoining river dock to the bins by a system of elevators, and the ashes will be returned to the river scows by the same means.

In the adjoining engine room will be 11 cross compound condensing engines. They will be of the vertical type, and each will have a maximum capacity of 6,600-horse power. They will stand in two rows parallel with the dividing wall of the power house, and each will be direct connected to a 3-phase alternating current generator. The current at 6,000 volts will be led to sub-stations where static and rotary transformers will convert it to the 550-volt current used in the conduits.

We are informed by President Vreeland that the estimated time of construction is 12 months. The whole equipment will not, of course, be put in at once, but it will be set up contemporaneously with the demand created by the ultimate extension of the underground trolley to the Broadway and Lexington avenue cable roads and to the various horse car lines owned or controlled by the company.

The Market for Gas Securities.

The tendency in city gas shares during the week, particularly in respect of Consolidated, was towards lower values, notwithstanding the fact that there was no good reason for the decline. The actual cause of the shrinkage is undoubtedly the fear on the part of timid holders that Tammany's candidate for Mayor (Mr. Van Wyck) seems to have the best chance for the first executive place in the new city. However, why his election should seriously hurt, or even in any way interfere with gas share values, is beyond our understanding. Tammany's whining slogan over dollar gas amounts to nothing, even if the 14th Street Society meant it seriously, for the action of the last Legislature settled definitely when New York city is to have gas at the dollar figure. The Senate that passed the graded rate bill will live during 1898, and it is not at all likely anything will occur to cause these legislators to change their minds. Even if such a revolution did occur, the courts of the State can be safely depended upon to maintain the inviolability of a contract which the graded bill certainly is.

The regular monthly meeting of the Consolidated Company is to be held to day (Friday), and if we mistake not its outcome will be especially important. The stock sold down to-day to 201¼, and at 2 P.M. the quotation was 203½. It is very cheap. Standard common and preferred were steady to strong, and the same may be said of New York and East River. Mutual is a trifle easier than last week. Brooklyn Union was dull and lower. Chicago gas ruled strong at 97, and a fraction. Bay State is now capitalized in $50,000,000, which certainly looks to be enough capital to represent the assets at its command. Consumers, of Jersey City, is quoted at 74 bid, ex div. of 2½ per cent. As a rule the outside list is strong.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

NOVEMBER 1.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	202	203
Central	500,000	50	..	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	280	290
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	338	350
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	..	
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	83	88
Preferred	2,000,000	100	106	110
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	105	106½
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	142	144
Preferred	5,000,000	100	152	158
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	122¾	123
" " Bonds (5's)	15 000,000	1,000	113	114
Bay State	50,000,000	50	4	4¼
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	93	..
2d " " " "	3,000,000	1,000	80	81
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	97¼	97⅜
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	104	104¼
Columbus	1,069,000	.	91	94
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	74	77x
" Bonds	600,000	1,000	103	105
Cincinnati G. & C. Co.	8,500,000	100	201	202
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	58¼	59
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..

Detroit	4,000,000		53½	54
" Con. Bonds	4,312,000	..	85	90
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	81	85
" Bonds	2,000,000	..	93	95
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	118	125
" Bonds, 6's	2,650,000	..	107	109
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	86	88
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	42	43
Preferred	2,500,000	100	88	95
Bonds	9,084,400	1,000	101½	102
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	124	130x
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	94	94½
St. Paul Gas Light Co	1,500,000	100	49	51
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	2,500,000	25	21	25
Bonds	1,000 000	.	98	100
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	84	86
Bonds, 5's	3,556,000	.	98	100
Wilmington, Del.	550,000	50	200	202

Advertisers' Index.

GAS ENGINEERS.

Page

Wm. Henry White, New York City ... 715
Fred. Bredel, Milwaukee, Wis. ... 700
Geo. R. Rowland, New York City ... 715
The Western Gas Construction Co., Fort Wayne, Ind. ... 706
Humphreys & Glasgow, New York City ... 702
American Gas Co., Phila., Pa. ... 700
David Leavitt Hough, New York City ... 717
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 715

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. ... 713
United Gas Improvement Co., Phila., Pa. ... 705
Burdett Loomis, Hartford, Conn. ... 714
National Gas and Water Co., Chicago, Ills. ... 707
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 715
The Western Gas Construction Co., Fort Wayne, Ind. ... 706
Humphreys & Glasgow, New York City ... 702

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 716
Continental Iron Works, Brooklyn, N. Y. ... 714
Deily & Fowler, Phila., Pa. ... 716
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 712
Stacey Mfg. Co., Cincinnati, Ohio ... 715
Bartlett, Hayward & Co., Baltimore, Md. ... 713
Davis and Farnum Mfg. Co., Waltham, Mass. ... 712
R. D. Wood & Co., Phila., Pa. ... 714
Isbell-Porter Company, New York City ... 714
Fred. Bredel, Milwaukee, Wis. ... 700
United Gas Improvement Co., Phila., Pa. ... 705
Berlin Iron Bridge Co., East Berlin, Conn. ... 702
National Gas and Water Co., Chicago, Ills. ... 707
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 715
The Western Gas Construction Co., Fort Wayne, Ind. ... 706
Humphreys & Glasgow, New York City ... 702
Gas Engineering Co., Pittsburgh, Pa. ... 712
American Gas Co., Phila., Pa. ... 700
Logan Iron Works, Brooklyn, N. Y. ... 716
Riter & Conley, Pittsburgh, Pa. ... 699

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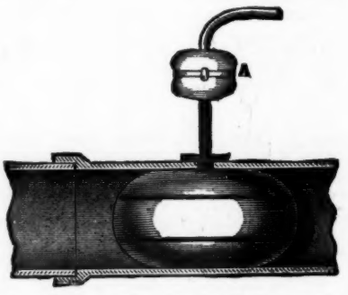

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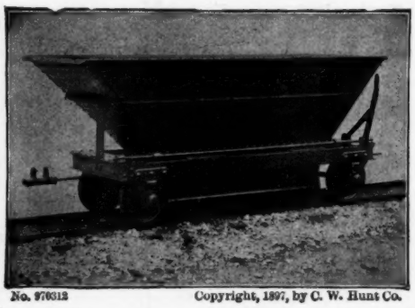

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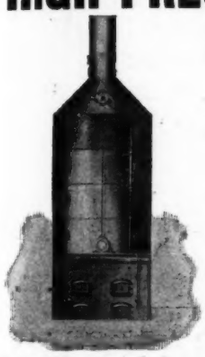

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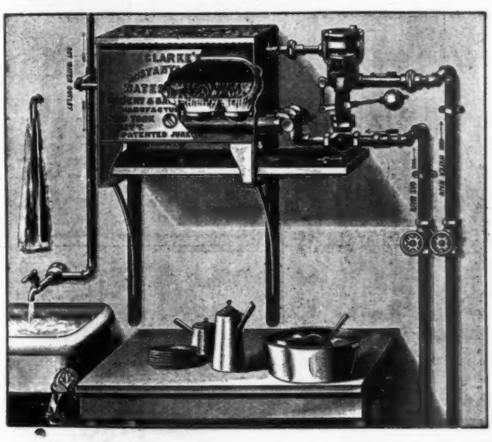

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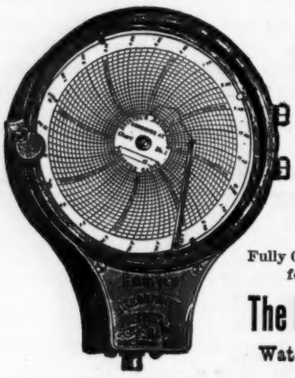

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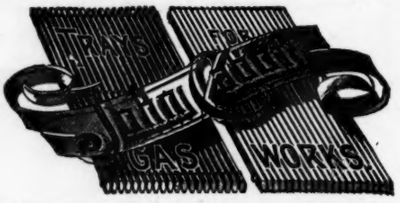

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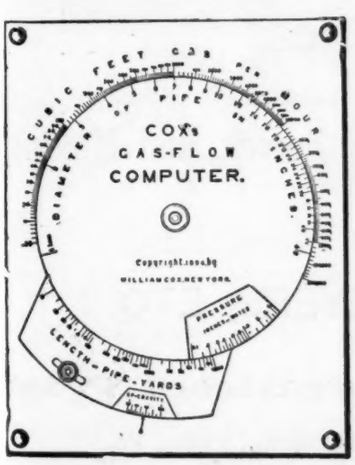

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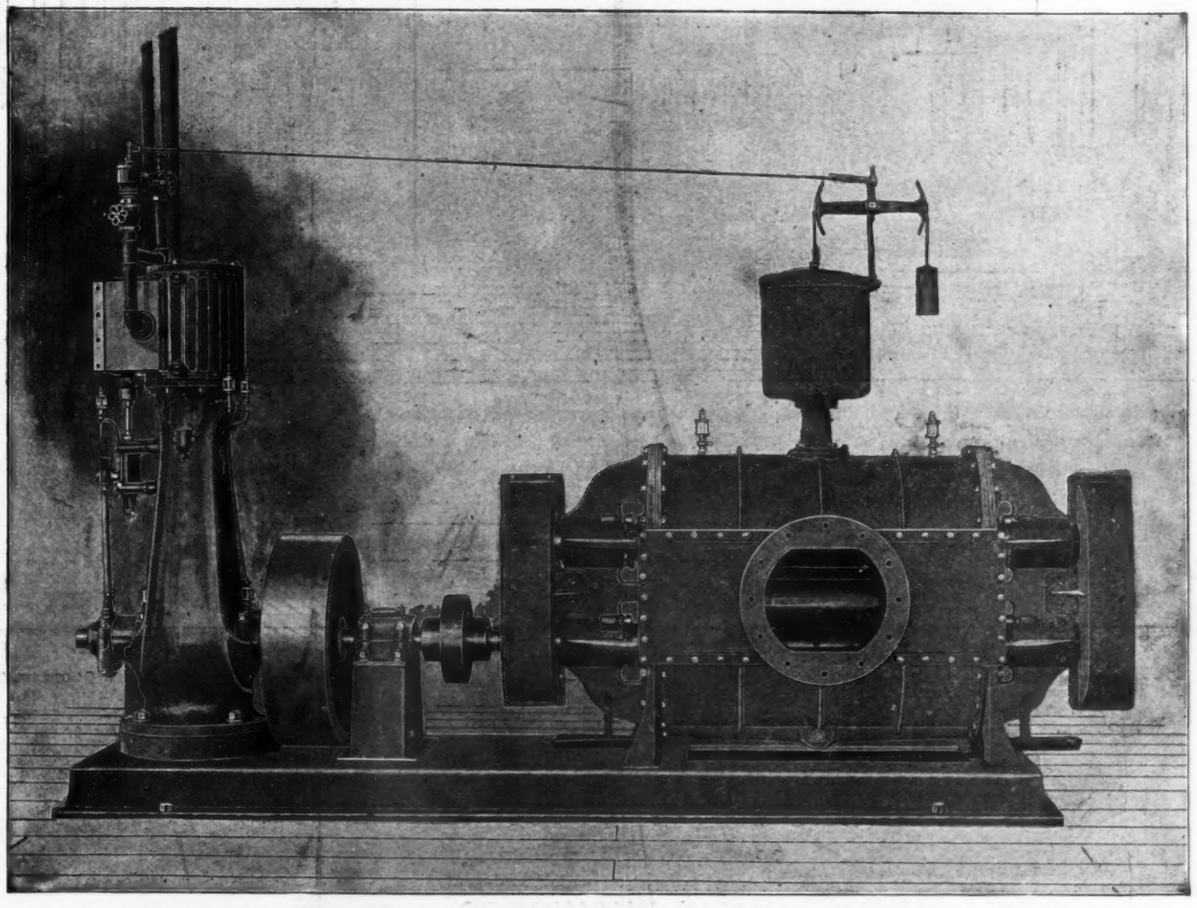

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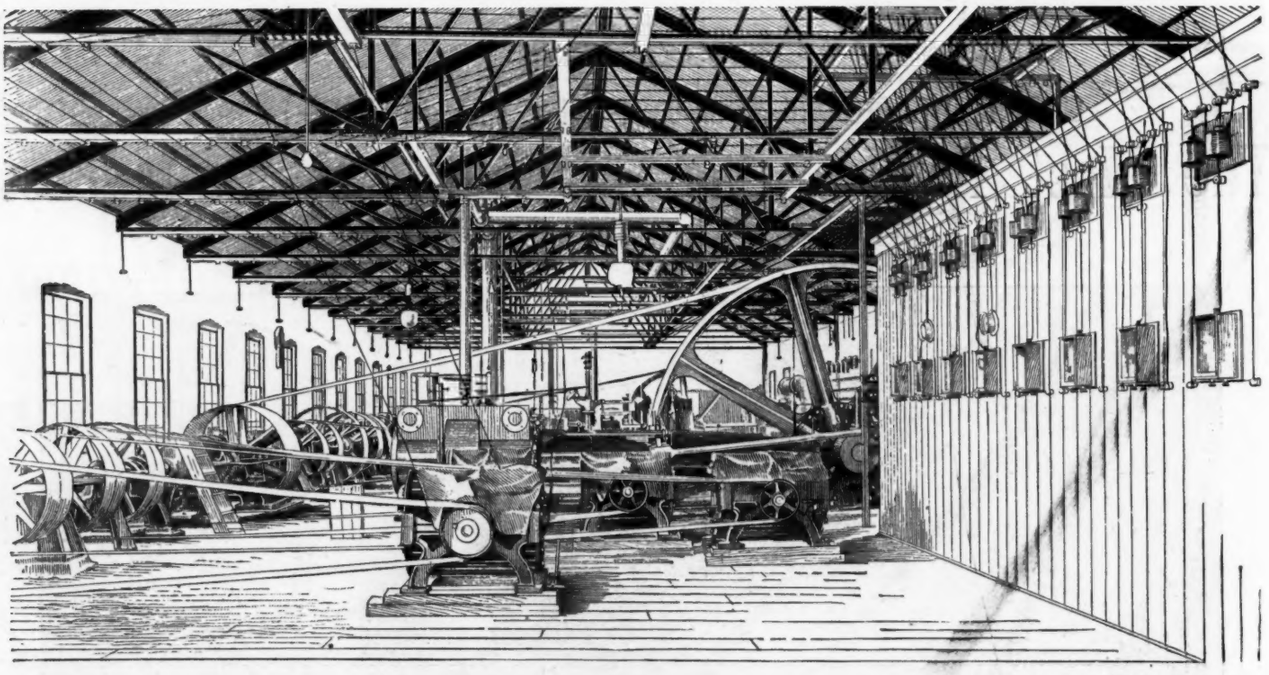

The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us for the Connecticut Electric Light Co., at Waterbury, Conn. The building is 51 feet in width by 251 feet in length, with brick walls and iron truss roof covered with corrugated iron. For an Electric Light Station, where the risk from fire is very great, this construction particularly commends itself, as this risk is entirely eliminated.

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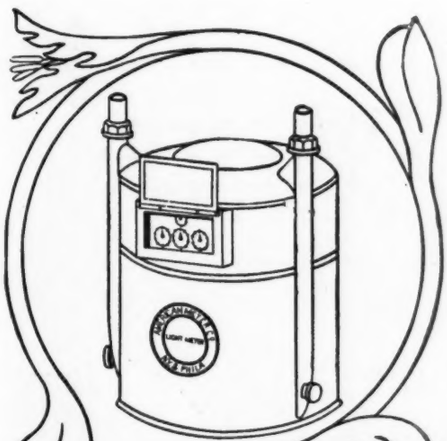

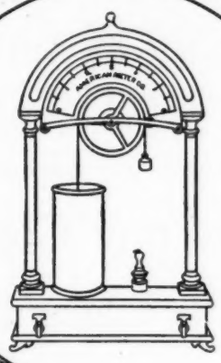

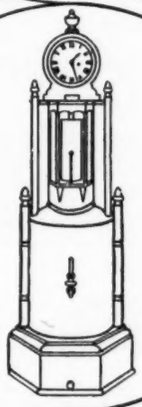

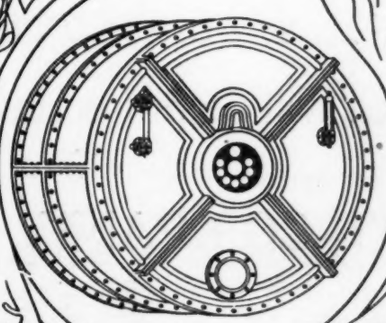

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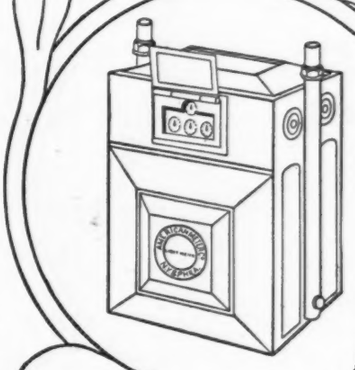
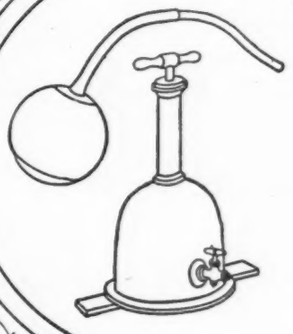
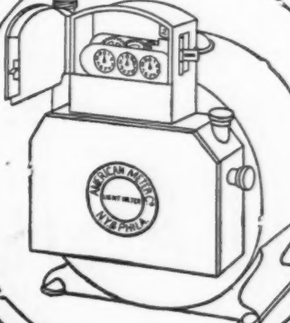
PUBLIC LIGHTING TABLE.

NOVEMBER, 1897.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Mon.	1	10.40 PM FQ	5.30 AM	4.45	5.35
Tue.	2	11.50	5.30	4.45	5.35
Wed.	3	12.50 AM	5.30	4.45	5.35
Thu.	4	1.50	5.30	4.45	5.35
Fri.	5	3.00	5.30	4.40	5.45
Sat.	6	4.00	5.30	4.40	5.45
Sun.	7	No L.	No L.	4.40	5.45
Mon.	8	No L. FM	No L.	4.40	5.45
Tue.	9	No L.	No L.	4.40	5.45
Wed.	10	5.20 PM	6.20 PM	4.40	5.45
Thu.	11	5.20	7.00	4.40	5.45
Fri.	12	5.20	7.50	4.30	6.00
Sat.	13	5.20	8.50	4.30	6.00
Sun.	14	5.10	9.50	4.30	6.00
Mon.	15	5.10	10.50	4.30	6.00
Tue.	16	5.10	12.00 AM	4.30	6.00
Wed.	17	5.10 LQ	1.00	4.30	6.00
Thu.	18	5.10	2.10	4.30	6.00
Fri.	19	5.10	3.20	4.25	6.00
Sat.	20	5.10	5.50	4.25	6.00
Sun.	21	5.10	6.00	4.25	6.00
Mon.	22	5.10	6.00	4.25	6.00
Tue.	23	5.10 NM	6.00	4.25	6.00
Wed.	24	5.10	6.00	4.25	6.00
Thu.	25	5.10	6.00	4.25	6.00
Fri.	26	5.10	6.00	4 20	6.10
Sat.	27	5.10	6.00	4.20	6.10
Sun.	28	8.30	6.00	4.20	6.10
Mon.	29	9.40	6.00	4.20	6.10
Tue.	30	10.40 FQ	6.00	4.20	6.10







TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45

To Whom It May Concern.

WE have learned that the makers of the "Sunlight" lamp assert that there has been a decision in the English Courts which saves them and their customers from liability as infringers of the Welsbach patents.

We assure the public there is no decision of any Court, in England or elsewhere, that directly or indirectly warrants the statement or inference that the lamp sold by the Sunlight Incandescent Gas Lamp Company of America is not an infringement of the Welsbach Light as made under the American patents, of which the Welsbach Light Company is sole and exclusive owner.

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Year.	No. of Sets.	Daily Capacity.
1883	2	900,000 Cubic Feet.
1885	5	2,250,000 "
1886	8	2,650,000 "
1887	11	5,200,000 "
1888	5	2,450,000 "
1889	12	3,575,000 "
1890	21	10,050,000 "
1891	31	22,875,000 "
1892	25	15,575,000 "
1893	20	9,875,000 "
1894	22	10,525,000 "
1895	23	12,300,000 "
1896	30	19,550,000 "
1897	21	9,425,000 "

Total Number of Sets - 236

Total Daily Capacity - 127,200,000 Cu. Ft.

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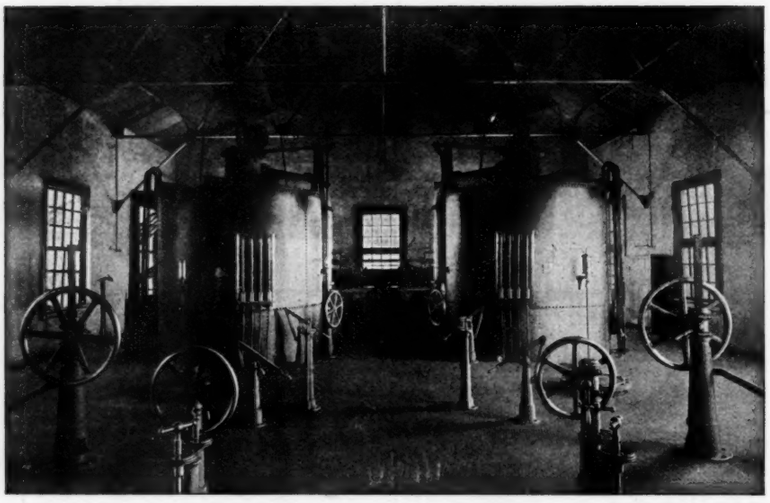

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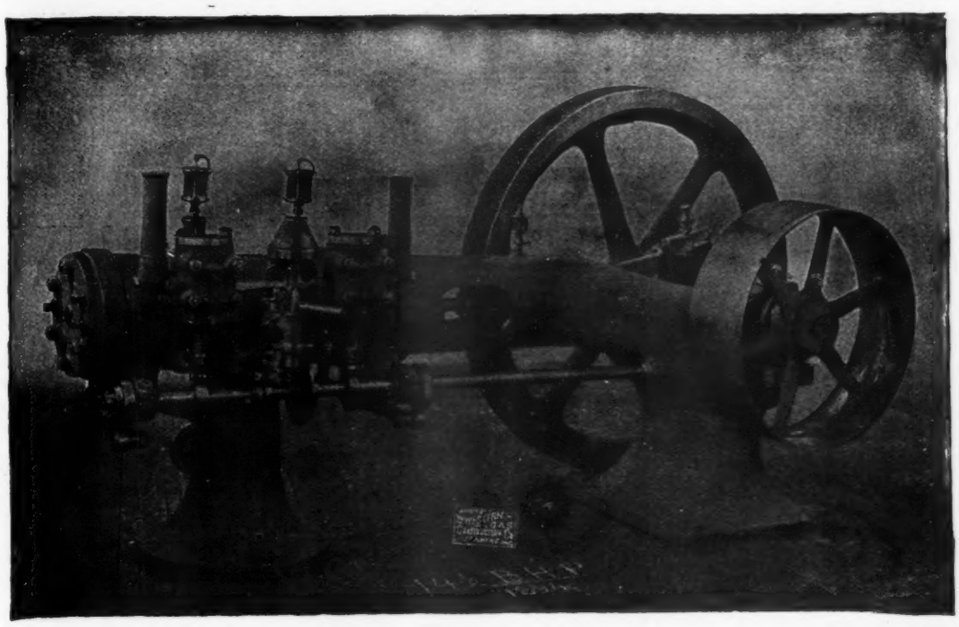

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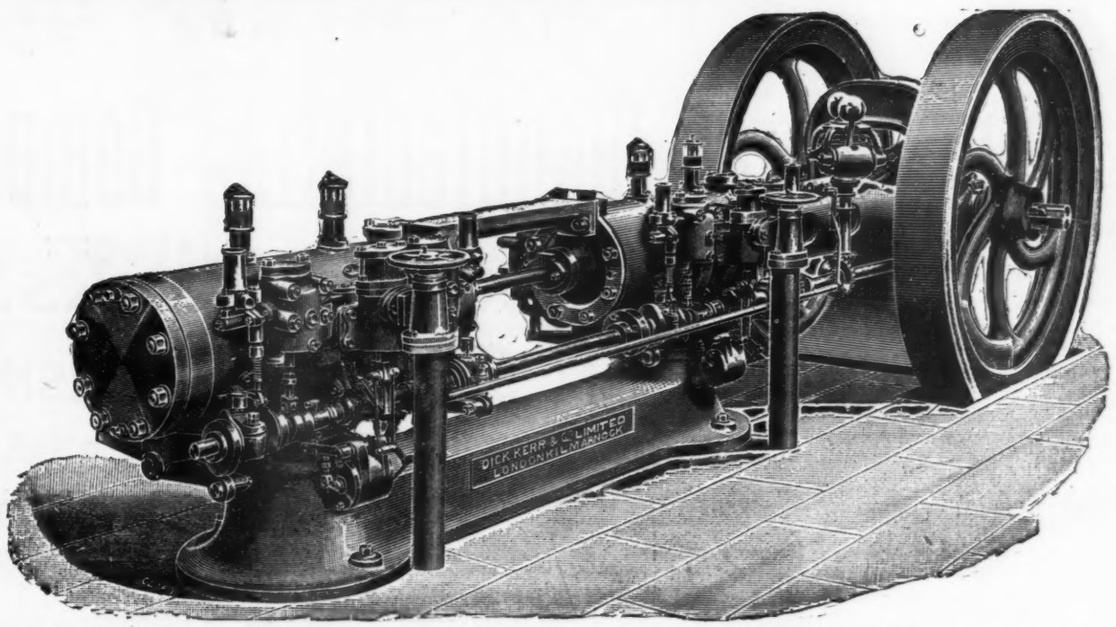

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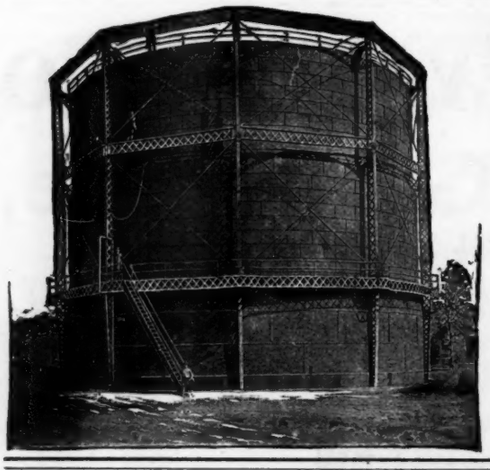

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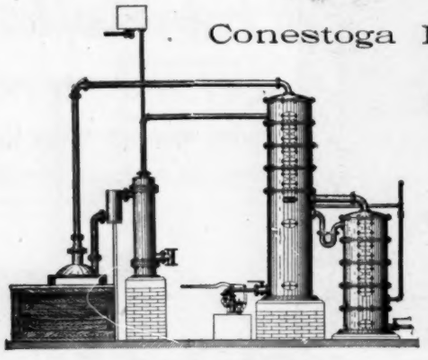

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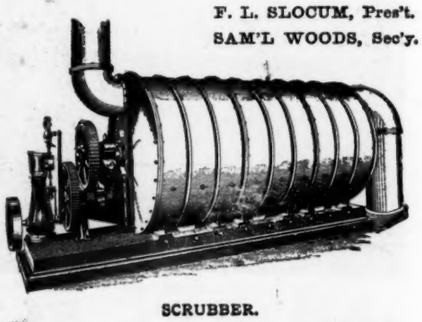

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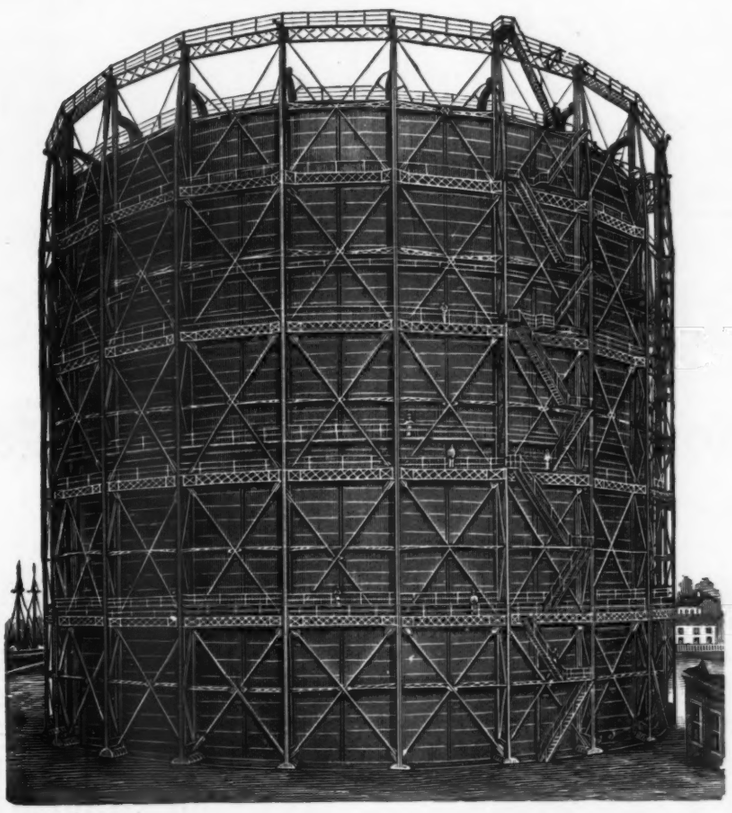

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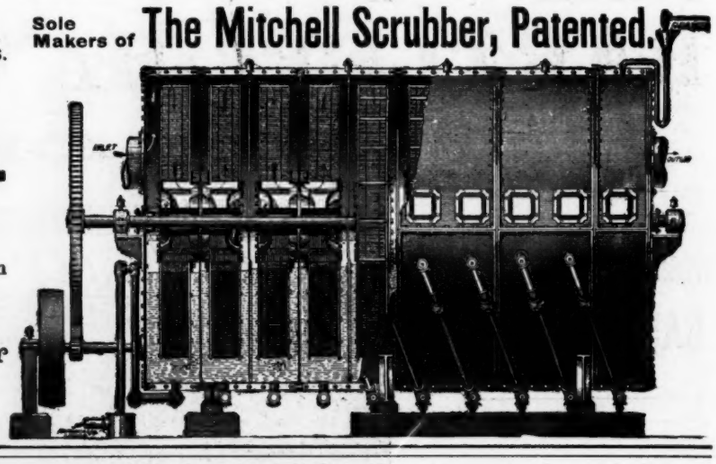

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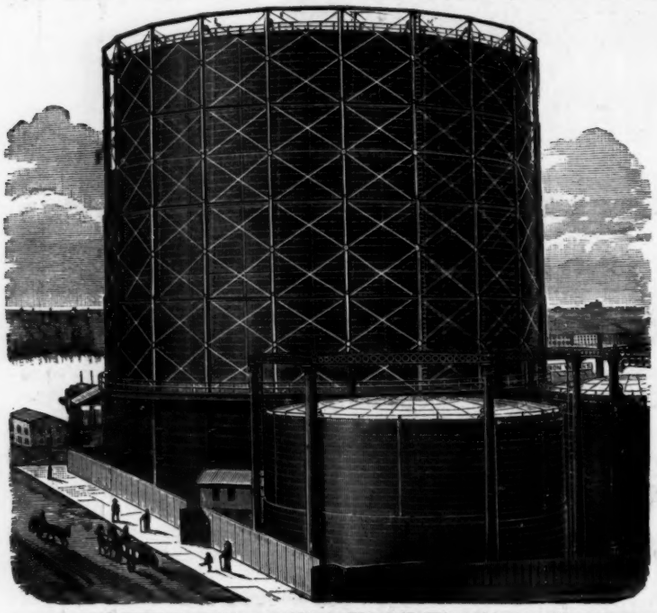

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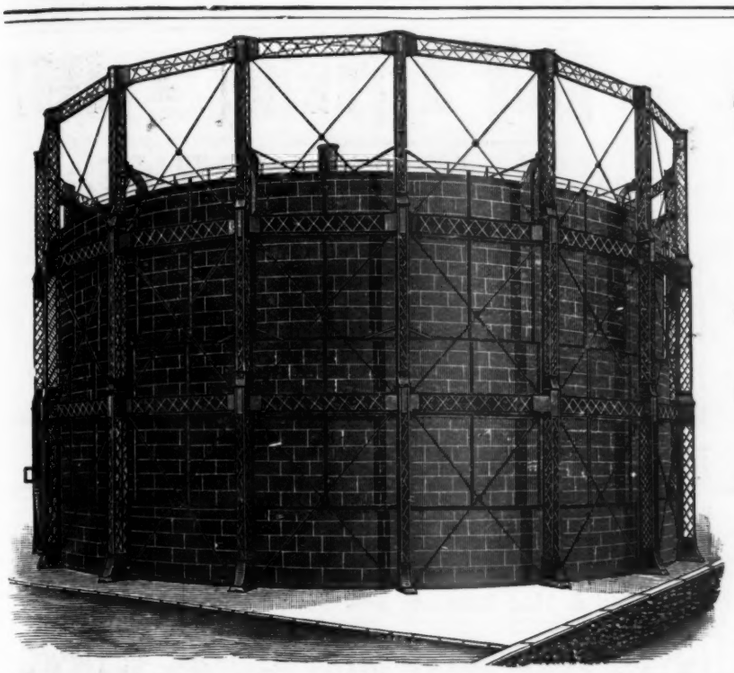

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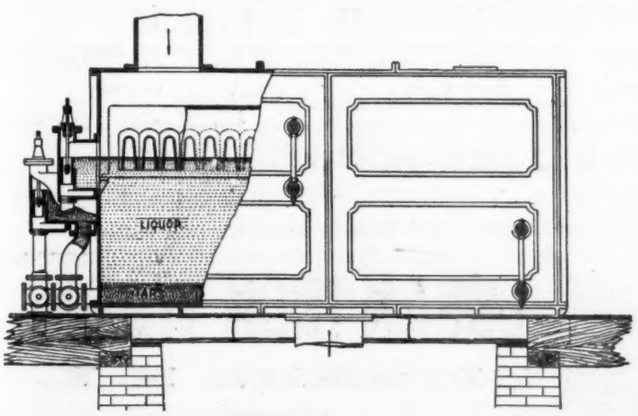

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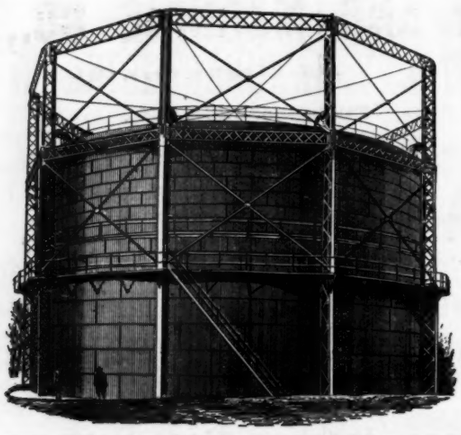

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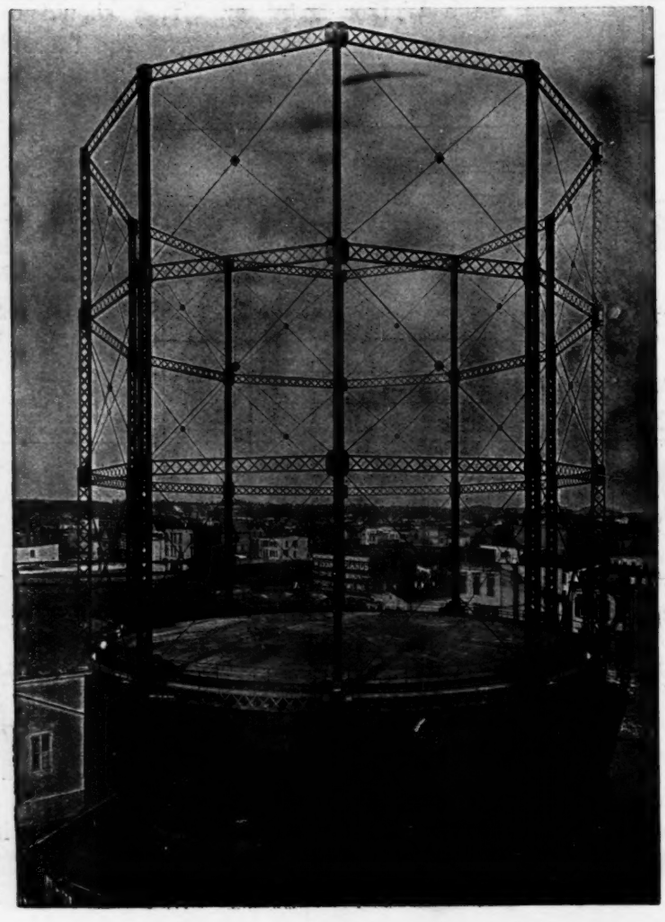

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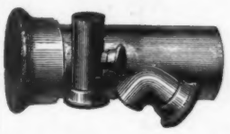

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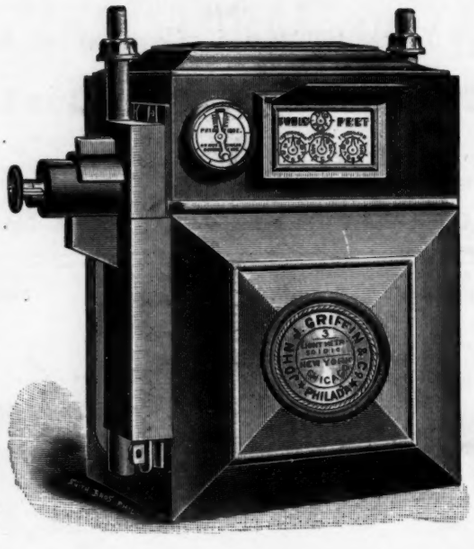

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